C627

MAINTENANCE MANUAL

CE-24A FREQUENCY SELECTIVE LEVELMETER

Cushman Electronics, Inc.

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APPLICABLE TO INSTRUMENTS
WITH SERIAL NUMBER 2381
AND ABOVE

MODEL CE-24A
FREQUENCY SELECTIVE
LEVELMETER

MAINTENANCE MANUAL

Cushman
Electronics, Inc.

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SECTION 1
THEORY OF OPERATION

GENERAL

1.01 The following circuit descriptions are given to provide an understanding of the functioning of the electronics of the CE-24A Frequency Selective Levelmeter. Refer to the CE-24A Operation Manual for a description and use of the front panel controls and operating procedures. Instrument specifications are given in Table 1-1.

1.02 In the circuit descriptions, reference to discrete components is made through the use of a Circuit Reference Series. This series assigns numbers to the different circuit assemblies. The numbers are assigned as follows:

Ckt. Ref. No.	Circuit Name
1000	Front Panel, Interconnections
2000	Main Chassis, Interconnections
2100	First L. O.
2200	RF Amplifier
2300	First IF Amplifier
2400	Second Mixer & Second L. O.
2500	Second IF & Gain Switch
2600	Audio/Meter Amplifier
2700	First Mixer
3000	Logic Container, Interconnections
3100	Logic
3200	LED Display
4000	Rear Panel

The full reference to circuit components is made by combining the Circuit Reference Number, the component designation letter and the component number. For example, the first transistor in the RF Amplifier circuit will be Q2201, the third resistor, R2203, etc. When describing the individual circuits the component designations will be abbreviated, Q1, R3, etc., unless reference is made to a component in another circuit. In that case the full reference number will be given for that component.

FUNCTIONAL DESCRIPTION

1.03 The CE-24A is a double conversion superheterodyne receiver. Its purpose is to measure the level and frequency of signals between 200 Hz and 5 MHz.

1.04 The signal to be measured is fed through the input attenuators and the RF Amplifier. The input may be set for either balanced or unbalanced lines and the connection may be either bridging or terminated.

1.05 In the first mixer the signal is converted to the 10.7 MHz first IF. The Local Oscillator (LO) includes a phase lock loop for stable frequency control and may also be connected to an Automatic Frequency Control (AFC) loop which holds the IF frequency in the center of the wide or narrow bandwidth filters.

1.06 A digital counter, programmed to read out the input frequency directly, counts the first LO frequency. This counter is referenced to a crystal controlled reference oscillator. Counter readout is an LED display.

1.07 The second mixer converts the signal to 2 kHz. The second LO functions both as the second LO and the carrier reinsertion oscillator for SSB demodulation.

1.08 The 2 kHz second IF passes through the wide or narrow bandwidth filters to a set of attenators that compensate for the Low Noise/Low Distortion settings and for the adjustments due to different line terminations. This makes it possible for the meter to be calibrated in dBm for any of the different input impedances and the Low Noise/Low Distortion modes.

1.09 The second IF Output is applied to a meter detector which drives the meter. The second IF also goes to an Audio Amplifier which drives the built-in speaker, or headphones when they are plugged in. The second IF is also connected to a phase detector, which receives its other input from the reference oscillator. The phase detector output is then used for the AFC loop.

1.10 An output from the 100 kHz reference oscillator is connected to the calibration amplifier to be switched to the input in the CAL mode. Thus both the level and the frequency of the CE-24A may be calibrated.

CIRCUIT DESCRIPTION

1.11 RF Amplifier. 2200

1.12 Input to the RF Amplifier, Figure 3-5, comes through the input jacks, J1002, J1003, to the BAL/UNBAL Switch, S1007, Figure 3-1, to the IMPEDANCE Ω Switch, S2001, the TERM/BRDG Switch, S2002, Figure 3-2, and then to the inputs of the RF Amplifier.

1.13 The signal first passes through two 0 dB or 10 dB attenuators, one in each input channel. The series attenuators, R3, C2 and R18, C9 are

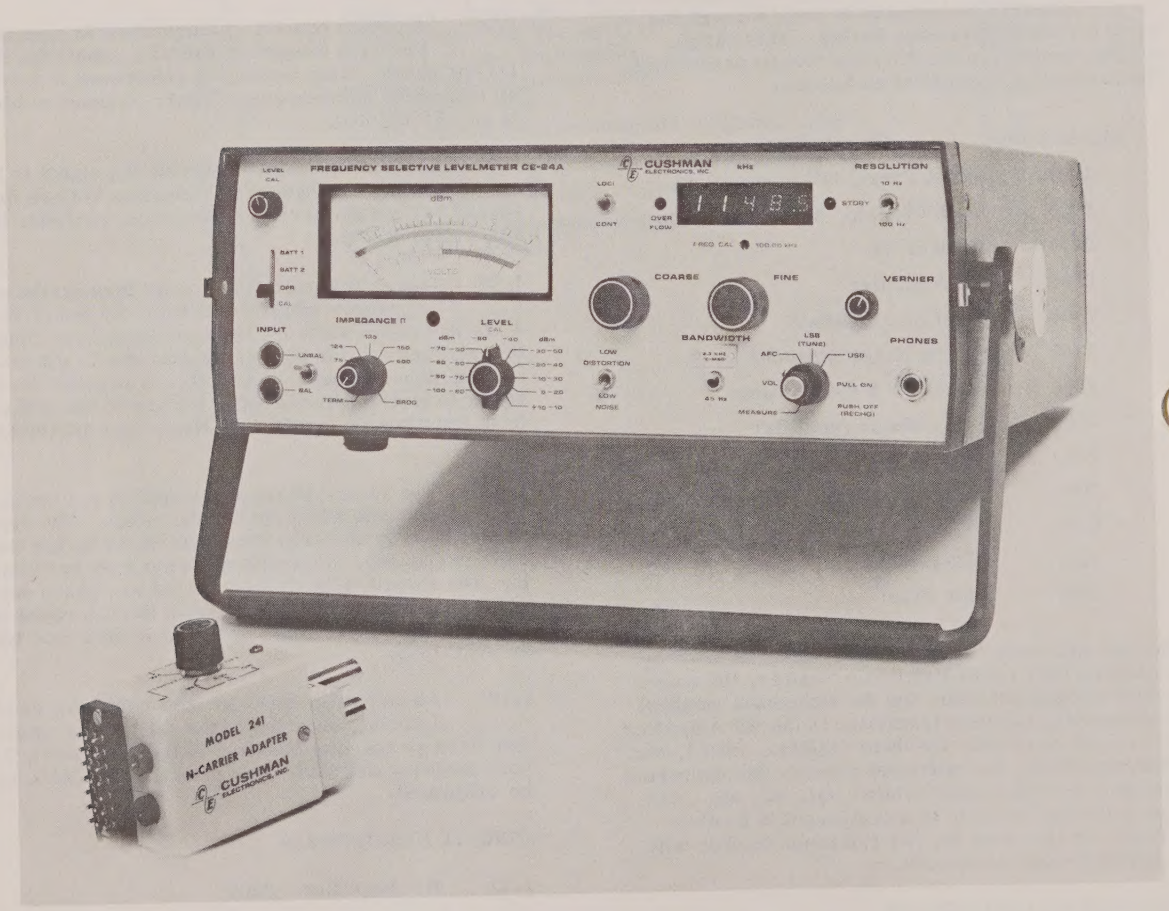


Figure 1-1. CE-24A Frequency Selective Levelmeter

TABLE 1-1. CE-24A SPECIFICATIONS

ITEM	CHARACTERISTICS
FREQUENCY	
Range	.2-5000 kHz
Resolution	10 Hz or 100 Hz, selectable
Accuracy	±1 Count ±10 PPM
Display	LED, Continuous Tuning
LEVEL MEASUREMENT	
Range (Referred to zero dBm on Meter)	
Low Noise (.2-5000 kHz)	-80 to +10 dBm
Low Distortion (1-5000 kHz)	-100 to -10 dBm
Accuracy (Referred to zero dBm on Meter)	
100 kHz at -40 dBm	±.2 dB
Frequency Response	
75Ω, 124Ω, 135Ω, 150Ω (Referred to 100 kHz) .2-5000 kHz	
25°C ±10°C	±.2 dB
0°C to 55°C, Additional	±.2 dB
600Ω (Referred to 100 kHz)	
.2-650 kHz	±.2 dB
Attenuator (Referred to -40 dBm)	±.2 dB
Meter Range	-20 to +2 dBm
INPUT	
Impedance	
Unbalanced	75, 124, 135, 150, 600, 10kΩ Shunted by Approx. 24pF
Balanced	75, 124, 135, 150, 600, 20 kΩ Shunted by Approx. 12pF
Return Loss 75Ω	≥ 30 dB
Common Mode Rejection (Balanced)	≥35 dB
BANDWIDTH	
Wide	
3 dB	2.3 kHz
60 dB	≤ 5.1 kHz
Narrow	
3 dB	45 Hz
60 dB	≤ 450 Hz
Optional Wide	
3 dB	3.1 kHz
60 dB	≤ 6.5 kHz

TABLE 1-1. CE-24A SPECIFICATIONS (Cont'.)

ITEM	CHARACTERISTICS
INTERNAL DISTORTION ATTENUATION	
Low Distortion Mode (75Ω)	
Harmonic	
For 60 dB Sensitivity Increase (Fundamental ≤ 0 dBm)	≥70 dB
Noise Power Ratio (Equivalent 600 Channel System with Stopband Slot at 2.438 MHz)	
For 40 dB Sensitivity Increase	≥50 dB
INTERMEDIATE FREQUENCIES	
IF1	10.7 MHz
IF2	2 kHz
INTERNAL PHASE JITTER, Low Noise	1°P-P Nominal
IF REJECTION	≥70 dB
IMAGE REJECTION	≥70 dB
OUTPUT (Nominal)	
Audio	
Speaker Power	100mV
Phones Jack (Voltage into 600 ohms at 0 dB on meter)	0V to >2V RMS
Distortion, at 0 dB on meter, 300 Hz to 3 kHz	≤5%
Demodulation	LSB or USB
POWER	
AC	50-400 Hz 115/230V ± 10% 14 Watt
Batteries	
Capacity	2.3 AH (12V, 130mA Nominal) 6.3 AH (6V, 560mA Nominal)
Operating Time	10 Hours Approx.
Recharge Time	14 Hours Minimum at 25°C
DIMENSIONS	
Height	5 1/4" (13.34 cm)
Width	14" (35.56 cm)
Depth	16" (40.64 cm)
WEIGHT	25 lbs. (11.34 kg)
ENVIRONMENTAL	
Temperature, Operating	0°C to +55°C
Storage	-40°C to +75°C
Humidity	95% RH, 40°C
Shock	10-55 CPS, .01" (.025 cm) p-p
Altitude, Operating	25,000 ft. (7.62 km)
Non operating	15,000 ft. (4.57 km)

TABLE 1-2. 241 N Carrier Adapter Specifications

ITEM	CHARACTERISTICS
EQUIPMENT COMPATIBILITY	CE-24, CE-24A
FREQUENCY RANGE	1 kHz to 3.2 MHz
INSERTION LOSS (135Ω System)	
1 kHz to 650 kHz	0 dB
650 kHz to 1 MHz	≤ 0.1 dB
1 MHz to 3.2 MHz	≤ 0.2 dB
CROSS TALK (Between Adjacent Pairs Properly Terminated)	≤ 40 dB to 1 MHz
INPUT CONNECTORS	
N-Carrier	W.E. 20 pin N-Carrier Type KS14160-L1 or Cinch 213-20-00-116
Signal	0.75 Inch Spaced Red and Black Banana Jacks
OUTPUT CONNECTORS	Dual W.E. 75Ω Coaxial, Trompeter PL2W
BREAKDOWN VOLTAGE	300V DC Max. from any input to ground.
DIMENSIONS (Excluding W.E. Plugs)	
Height	3.0" (7.62 cm)
Width	2.1" (5.33 cm)
Length	3.9" (9.91 cm)
WEIGHT	.5 lb. (.23 kg) Approx.
ENVIRONMENTAL	
Temperature, Operating	0°C to 55°C
Temperature, Storage	-40°C to 75°C
Humidity	95% R.H., +40°C
Vibration	10-55 Hz 0.01" (.025 cm) Amplitude P-P.
Shock (W.E.) Connectors Protected)	4 ft. Bench Drop
Altitude	
Operative	15,000 ft. (4.57 km)
Non-operative	25,000 ft. (7.62 km)

switched in or out by FET switches Q1 and Q2. The shunt attenuators R5, R25 are switched out or in by FET switches, Q5, Q6. Transistors Q3, Q4 control the switches Q1, Q2.

1.14 10 dB attenuation is in the circuit, with switches Q1, Q2 open and switches Q5, Q6 closed, in all positions of the Attenuator switch, S2003, except -70, -80 dBm (-90,-100 dBm). In these low level settings the attenuation is switched to 0 dB.

1.15 Output from each attenuator goes to the Balanced-to-Unbalanced differential amplifier Q9, Q11, where the outputs are combined to provide a single ended output. (When the Input UNBAL mode is used the input to the BAL channel is grounded by the BAL/UNBAL switch, leaving the unused input jack open.) Q10 is a constant current source for Q9, Q11 to provide stable amplifier gain. Q15 buffers the output to the 0-70 dB attenuator switch, S2003. Q18 is a switch that turns off Q10 to disable the differential amplifier Q9, Q11 when the CE-24A is in the CAL mode, to prevent RF feedthrough from the input.

1.16 Also on this board is the Calibration amplifier and isolator. Input from the 100 kHz reference oscillator on the Logic board, 3100, is brought into the emitters of common base amplifiers, Q16, Q17, which provide a high degree of isolation. Output from the isolation amplifier is applied to the inputs of differential amplifier Q12, Q14, and the single ended output of Q12 is connected to the input of buffer amplifier, Q15. Q13 is a current source for Q12, Q14. R36 is an internal calibration level adjustment. The amplifier is turned off when not needed by connecting the base circuits of Q12, Q14 to ground through the CAL/OPR/BATT switch, S1001. CR7 provides temperature compensation for the base-emitter voltage of Q13.

1.17 The 70 dB attenuator, S2003, is mounted on the front panel, Figure 3-3, and is made up of a 10 dB, 20 dB and a 40 dB attenuator. These attenuators are switched in to give a total of 70 dB attenuation in 10 dB steps.

1.18 First IF Amplifier. 2300

1.19 Output from the 0-70 dB step attenuator enters this board through RF Amplifier, Q1, Q2, then passes through the 5 MHz low pass filter C7-C13, L3-L5 to the first mixer in the 2700 circuit enclosure. See Figure 3-6.

1.20 The 10.7 MHz first IF output from the First Mixer is amplified in the 1st IF Amplifier No. 1, Q4, Q5, then passes through the 10.7 MHz low pass filter, FL1, to the 1st IF Amplifier No. 2, Q3. Output from Q3 is coupled to the 1st IF Amplifier No. 3 on board 2400 through impedance matching Auto-transformer, T1.

1.21 First Mixer. 2700

1.22 The output of the 5 MHz low pass filter on board 2300 is connected to the center tap on the primary of mixer transformer, T2. See Figure 3-10. The 10.7-15.7 MHz L. O. enters the mixer through the low pass filter C1-C3, L1, L2 to the mixer transformer, T1. CR1-CR4, C4, C5, R1-R3 make up the remainder of the balanced mixer. Balance is adjusted for minimum LO feedthrough with C5 and R3. The 10.7 MHz output to the 1st IF Amplifier is taken from the secondary of T2.

1.23 Second Mixer and Second LO. 2400

1.24 The output of 1st IF Amplifier No. 2 enters this board through T1 and is amplified by common base 1st IF Amplifier No. 3, Q1. See Figure 3-7. Output from Q1 goes to the Second Mixer transformer, T2. The second LO frequency of 10.698 MHz or 10.702 MHz is generated by crystal oscillator Q5, Y1. The frequency is set by the bias on the varicap, CR6, by setting of R20. The LSB/USB switch either grounds or opens the circuit to pin 17, thus changing the oscillator frequency from 10.698 to 10.702. Oscillator output is amplified in emitter coupled pair Q6, Q7 and is then connected to the second mixer transformer, T3. The second LO functions as both an LO and a carrier reinsertion oscillator for SSB demodulation.

1.25 Output from the second mixer, taken from the center tap of mixer transformer, T2, goes to the second IF amplifier No. 1. Common base amplifier, Q2, provides isolation and further gain is provided by complementary pair Q3, Q4. Q8 is a current source for the amplifiers.

1.26 Second IF and Gain Switch. 2500

1.27 Amplified output from the second mixer enters board 2500 through pin 2 to either the 45 Hz filter or to the 20 dB amplifier, Q2, determined by the setting of the BANDWIDTH switch, S1004. In the 45 Hz BANDWIDTH setting Q2 is biased off by Q1 and Q5 is biased on by Q1, Q4 to connect the 45 Hz filter output to second IF Amplifier, IC1. Source follower, Q3, provides a high impedance termination for the filter. In the 2.3 kHz mode, Q2 is biased on and Q5 is biased off so that signal is routed through Q2 to the Second IF amplifier IC1. 20 dB gain through Q2 in the 2.3 kHz mode is necessary to compensate for the voltage gain through the 45 HZ filter (filter input impedance of 43.2Ω to the 294kΩ impedance at the input of the source follower, Q3). R6 is the calibrating adjustment to equalize the gain in both modes.

1.28 Output from the Second IF Amplifier, IC1, passes through the Signal to Noise Select Attenuator. Q8, Q9, Q10 are used to switch attenuation in or out in 10 dB steps as required in the LOW NOISE or LOW DISTORTION mode taking into account the settings of the Balanced 10 dB Attenuator and the RF Attenuator. The complete Attenuator switching pattern is given in Table 1-3. CAL and LOW NOISE switching through Q6 and Q7 override other settings as necessary.

Table 1-3. CE-24A ATTENUATOR AND IF GAIN SWITCHING

Input Level		Low Noise (LN) Mode			Low Distortion (LD) Mode		
LN	LD	Balanced 10 dB Pad (2200)	RF ATTEN (S2003)	IF GAIN (2500)	Balanced 10 dB Pad (2200)	RF ATTEN (S2003)	IF GAIN (2500)
+10	-10	10 dB	70 dB	0 dB	10 dB	70 dB	+20 dB
0	-20	10	60	0	10	60	+20
-10	-30	10	50	0	10	50	+20
-20	-40	10	40	0	10	40	+20
-30	-50	10	30	0	10	30	+20
-40	-60	10	20	0	10	20	+20
-50	-70	10	10	0	10	10	+20
-60	-80	10	0	0	10	0	+20
-70	-90	0	0	0	0	0	+20
-80	-100	0	0	+10	0	0	+30

1.29 The Impedance Select Amplifier isolates the S/N Select Attenuator from the following Impedance Select Attenuator. The settings of this attenuator, selected through switches Q11-Q14, adjust the level so that the meter will read correctly for the input impedance selected by the front panel switches.

1.30 Audio/Meter Amplifier. 2600

1.31 Input from the Second IF Gain switch through board pin B passes through a 7 kHz low pass R-C active filter. The output of Q1 drives IC1. The gain of IC1 is adjusted by the voltage variable resistance of Q4 which is adjusted with IC4, IC5, which in turn are controlled by the front panel LEVEL CAL control.

1.32 The signal from IC1 passes through board pin 16 to the front panel VOL control and back through board pin 17 to buffer, Q3, and then to the audio amplifier Op Amp IC3. Output then goes to the speaker and PHONE jack.

1.33 Output from IC1 also goes to the meter amplifier IC2 and rectifier CR1. The meter is in the feedback loop of IC2 to provide maximum linearity. Output from IC2 is rectified by Q2 and Q16. Q2 also provides current gain and R9, C11 smoothes the half sine wave to produce the DC RECORDER output through board pin 8.

1.34 An output from IC1 also goes to Q5. It operates as a saturated switch which squares up the signal and drives the one-shot IC6, C-D. The constant width pulse from the one-shot is applied to phase detector, IC7A, B. The other input to the phase detector is a 2 kHz output derived from the 100 kHz reference oscillator and is applied to the phase detector through the one-shot IC6A, B.

1.35 Output from the phase detector, IC7, CR12 and CR13 is applied to the AFC loop amplifier IC8 through R33. In the 2.3 kHz Bandwidth mode Q11 turns on. This shunts R33 with R34 to provide 20 dB additional gain required when operating this mode. Q7 provides a feedback path for the Loop Amplifier which causes the output of IC8 to be close to the voltage required by the Varicap, CR2114, to lock the loop when LSB or USB are selected. When AFC is selected, therefore, the loop is close to LOCK. This minimizes the time needed to acquire LOCK. Output from the loop amplifier goes to the vernier frequency varicap CR2114.

1.36 AC input from the power transformer is rectified by the 1N4002 diodes and regulated to the charging voltage of the -12V battery by zener diode, CR8, and series regulator, Q8. Output then goes to the battery through fuse F4003. Output also goes to the front panel off-on switch S1005 and then to the -10V regulator. CR9, R48, R47 and CR10 form an expanded scale voltmeter for monitoring the condition of BATT 2. Q9 protects the meter from overload when the battery is disconnected. Q10 forms a current source for CR10.

1.37 IC9 is the control amplifier that drives the series regulator, Q14. Voltage is adjusted with R59. Q15, R57 provide the short circuit protection. Q12 is a constant current generator and Q13 supplies the "B-" voltage and isolates the "B-" (about -10 volts) from the -10 volts which leave the board at pin K.

1.38 First L. O. 2100

1.39 The First L. O. frequency is generated by the VCO, Q24. The frequency is varied by the voltage applied to the varicap, CR13. In the LOCK/AFC mode the voltage applied to CR13 is the

summation of voltages from (1) the COARSE Frequency control, R1002, (2) the FINE Frequency control, R1003, through the VCO Steering Amplifier, Q13, Q14 and (3) the output of the VCO loop amplifier, IC2, which is determined by the phase detector output. The Harmonic Generator output frequencies are varied by the FINE control, R1003, the VERNIER control, R1004 (or the output of the AFC loop amplifier, IC2608, in AFC) through the Harmonic Generator driver. In the CONT mode the VCO loop amplifier output is clamped at a constant voltage so tuning is controlled only by the COARSE and FINE controls.

1.40 To provide good frequency stability the VCO is locked with the harmonics of the very stable 100 kHz Reference Oscillator through a phase detector and the VCO loop amplifier. The VCO locks on the 107th through the 157th harmonics of the 100 kHz reference. In order to provide continuous frequency coverage between the 100 kHz intervals, the 100 kHz Reference Oscillator is varied over a range of about -200 Hz to +1000 Hz by the FINE and VERNIER controls. When multiplied to the required harmonic numbers, this is a span of greater than 100 kHz, which more than covers the range between the lock points.

1.41 The frequency of the 100 kHz Reference oscillator is varied by the voltage applied to the varicap, CR6, by the FINE control, R1003, and by the voltage applied to the varicap, CR14, by the VERNIER control, R1004 and, when in the AFC mode, from the AFC loop amplifier, IC2608.

1.42 The high input impedance of FET amplifier, Q15, provides light loading for the output of the 100 kHz oscillator, Q11, Q12. Output from Q15 is amplified by the Harmonic Driver Q2-Q5 and applied to harmonic generator Q1, CR1. A wideband output load for Q1 is provided by transformers T1-T3 which emphasizes the higher order harmonics. This output is then applied to the phase detector CR2-CR5.

1.43 The frequency of the VCO is controlled by the voltage applied to the varicap, CR13 by the COARSE tuning, R1002, the VCO loop amplifier, IC2 and the VCO steering voltage from Q13, Q14 as noted before. Output from VCO, Q24, goes to the limiting circuit, Q19, Q20, which provides for a constant level output over the frequency range. Q20 drives the complementary emitter follower, Q21, Q22, which furnishes the output to the first mixer through isolation transformer, T4. Q19 drives the complementary emitter follower, Q16, Q17 which provides a low impedance output to drive the phase detector. L1, C13, C14 is a 16 MHz low pass filter to remove harmonics of the VCO frequency.

1.44 An output is taken from the junction of L1, C13 to the common base logic driver amplifier. The logic driver output is coupled out to the logic board, through isolation transformer, T5, where it is counted as the basis of the Frequency readout.

1.45 Output of the phase detector sampling gate, CR2-CR5, stores a charge on C20 to provide the control voltage. The output of C20 is buffered by Q8 and applied to the VCO loop amplifier IC2.

1.46 Control amplifier IC1, Q1 and series regulator Q6 provide regulated -10V for the First L.O. board. The reference voltage is taken from the output of the -10V regulator on the Audio/Meter board, 2600.

1.47 Logic. 3100

1.48 The prime purpose of the circuits on the Logic board is to take the output frequency of the first L.O. and, by means of a preset counter, generate a display that will read the frequency of the signal applied to the input of the CE-24A. The logic control circuits for the counter and the LED display, the 100 kHz crystal controlled Reference oscillator and the power supply and battery charger are also on this board.

1.49 The 100 kHz Reference Oscillator, Q1, Q2, Y1 (See Figure 3-12) is coupled out through a buffer inverter, IC1A, to provide a logic level output. CR3 provides temperature compensation for the oscillator. The output goes to the CAL Amplifier/Isolator on the RF board, through T1 and diode switch CR1, CR2. The output also goes to IC8B in the Period Select Synchronizer and to IC2 where it becomes the basic frequency for the Time Base Divider and the LED Display Multiplex circuits.

1.50 IC2 is a BCD divide-by-ten counter which drives the time base divider chain made up of IC5, IC7, IC8, each of which divide by ten and IC9A which divides by two to provide an output from IC9 of 5 Hz. Both the 5 Hz from IC9A and the 50 Hz output of IC8 are connected to Resolution control gate IC10A-D When +5V from the RESOLUTION switch, S3001, is applied to gate IC10 pins 10, 12, the 5 Hz signal passes through to the synchronizer, IC9B, providing 10 Hz resolution. When S3001 is set to 100 Hz RESOLUTION a ground level is applied to IC10 pins 10, 12 and 50 Hz passes to the synchronizer. The synchronizer is a J-K flip-flop connected so that the output follows the input on the occurrence of a clock pulse. The clock pulse is the 100 kHz reference frequency so the timing pulses are exactly synchronized. From the synchronizer the signal goes through inverter, IC4C, to the counter gate and preset circuits (Figure 3-13).

1.51 The BCD output of IC2 goes to the decimal decoder, IC3. The IC3 output is used to drive the Display Multiplexer Q9-Q12. The negative going count pulse out of IC3 turns on each transistor in sequence to enable the individual LED to read out the number stored in the segment decoder at that instant. This provides a LED duty cycle of 10% at a scanning rate of 10 kHz.

1.52 The decimal point light in the display is also controlled by the RESOLUTION switch through selection gates, Q5-Q7. A +5V applied to the gates selects 10 Hz Resolution and ground selects 100 Hz.

1.53 A 2 kHz signal from IC5 pins 11, 14 is inverted and applied to the optical coupler, IC6. This provides one signal to the phase detector

f the AFC control circuit on the Audio Meter board, 2600.

1.54 The 4 kHz output from IC5 pin 9 is buffered by IC1B, rectified by CR4, CR5 and the positive voltage level stored on C10. As long as the counter is counting, a positive voltage will appear on C10 which enables the 7 segment decoder IC27 (Figure 3-13) through IC1C, D. When no count is coming through IC5, C10 will lose its charge through R9 and the 7 segment decoder will be disabled, blanking the display. The display is also controlled by an input to IC1C pin 13 from the Counts Status Detector IC31 (Figure 3-13). When the counter displays a frequency <0 Hz the Status Detector enables a 5 Hz signal to IC1C pin 13 which causes the display to flash at a 5 Hz rate.

1.55 The 6V battery charger and 5V power supply are also on the Logic board. The output of the rectifier, CR6-CR9, is regulated by reference zener, CR12 and series regulator, Q3002. Charging voltage is adjusted with R23. The charging regulator output also goes to the 5 volt regulator, which is made up of control amplifier Q3, Q4, reference zener, CR11, and series regulator, Q3001. Voltage is adjusted with R26. R16, R17, R19 are the current overload resistors. When more than 1 amp flows, CR13 conducts, shutting off the series regulator, Q3001. R14, R18 are the scale adjusting resistors to the meter battery condition switch. CR10 provides overload protection for the meter.

1.56 The Time base output from the Period Select and Synchronizer inverter, IC4C, (H) (Figure 3-12) is connected to control circuits of the First L.O. Preset Counter (H) (Figure 3-13) to control the input gate and the preset and control circuits.

1.57 The L.O. frequency from the logic driver on board 2100 is coupled in through T2 and input amplifier, Q13. CR14 clips the negative pulses. The counter input gate, IC7A, is enabled by the Time base pulse for a period of 100 milliseconds in the 10 Hz Resolution mode or for 10 milliseconds for the 100 Hz Resolution mode; that is, the L.O. is counted for either 100 milliseconds or 10 milliseconds according to the RESOLUTION switch setting.

1.58 At the end of the count gate the negative going transition turns on the one-shot, IC17B, C which generates an approximately 0.7 microsecond negative pulse. This pulse is inverted in Q14 to provide a positive pulse to the enabling gates of storage registers IC12, 15, 19, 22, 25, and 28. The output of these registers is transferred to the multiplexing gates IC11, 14, 18, 21, and 24; to a Counter Status Detector input IC30, 31 and to IC27, a 7 segment decoder.

1.59 Output from Q14 also passes through coupling circuit C31, R46, R7 to provide an average level of +2.5V. The negative going part of the signal is inverted through IC17D to provide the positive preset pulse to the counters. This pulse is again inverted by Q15 to provide the Load pulse to the counters which load them to the preset count.

1.60 The preset pulse from IC17D always presets IC29 to 9 and IC16, 20 to 0. When the RESOLUTION switch is in the 10 Hz mode IC26 is preset to 3 and IC23 is preset to 0. In the 100 Hz RESOLUTION mode IC26 is preset to 9 and IC23 is preset to 3. Thus in the 10 Hz mode the counter is preset to 930000 and in the 100 Hz mode it is set to 993000.

1.61 When the counter gate is enabled the counter starts counting from the preset number and counts up to the maximum count and then starts over again from 000000 and counts up until the counter gate closes. The counter now has at its output, and stored in the storage register, the actual input frequency count.

1.62 As an example the input frequency is F_{in} = 123.45 kHz and the RESOLUTION switch is set to 10 Hz. The L.O. frequency which is to be counted will be $F_{in} + F_{if} = F_{lo}$. 123.45 kHz + 10,700 kHz = 10823.45 kHz. Since the counter gate will be open for only 100 milliseconds (0.1 second) the number of cycles that will pass the gate will be 10823.45 kHz x 0.1 = 1082345 cycles. Since the counter starts counting from 930000, 70000 must be subtracted from this number of cycles. (1000000 - 930000 = 70000). 1082345 - 70000 = 1012345. Since the counter only displays five digits, only the number 123.45 will be seen with the decimal point properly placed by the RESOLUTION switch.

1.63 An example in the 100 Hz mode where the count gate is open for 10 ms (.01 sec) and the counter is preset to 993000. F_{in} = 1234.50 kHz. F_{lo} = 1234.50 + 10700. kHz = 11934.50 kHz. 1000000 - 993000 = 7000 and 11934.50 kHz x .01 = 119345 cycles. 119345 - 7000 = 112345 which when displayed will read 1234.5 kHz.

1.64 The count out of the counter at the end of the count gate is transferred to the storage registers IC12, 15, 19, 22, 24 where it is held until the next count transfer. The multiplexer gates IC11, 14, 18, 21, 24 are enabled, each in turn by the same pulse that enables the LED anodes, see paragraph 1.51. The count in each storage register is then decoded in the 7 segment decoder, IC27, and the output applied to the LED segment drivers Q16-Q22. The complementary count in the storage registers is used because the count is again complemented in the multiplex gates.

1.65 The segment drivers are parallel connected to the LED segments. However, since only one LED and its associated multiplex gate is enabled at any time, the proper numbers will appear in the display. Since the sampling repetition rate is so rapid the display appears to be continuous to the eye.

1.66 The counter status detector, made up of IC30, IC31 and inverter IC4D, controls the OVERFLOW light and the flashing display. The OVERFLOW comes on only in the 10 Hz mode when the frequency

is set to 1000.00 kHz or greater. The display flashes at a 5 Hz rate when an improper count total is displayed, for example Frequency 000.00 kHz.

1.67 IC30A senses the 1.000000 MHz or greater count in IC28 and turns on the OVERFLOW light through IC30B, IC30C. Whenever the Resolution mode switch is set to 100 Hz or the flashing display is operating IC30B inhibits the OVERFLOW. IC31A senses an improper count in IC25 and IC31B senses an improper count in IC28. Together with IC31C they enable IC31D to pass the 5 Hz signal to flash the display through IC1C, IC1D which control the 7 segment decoder.

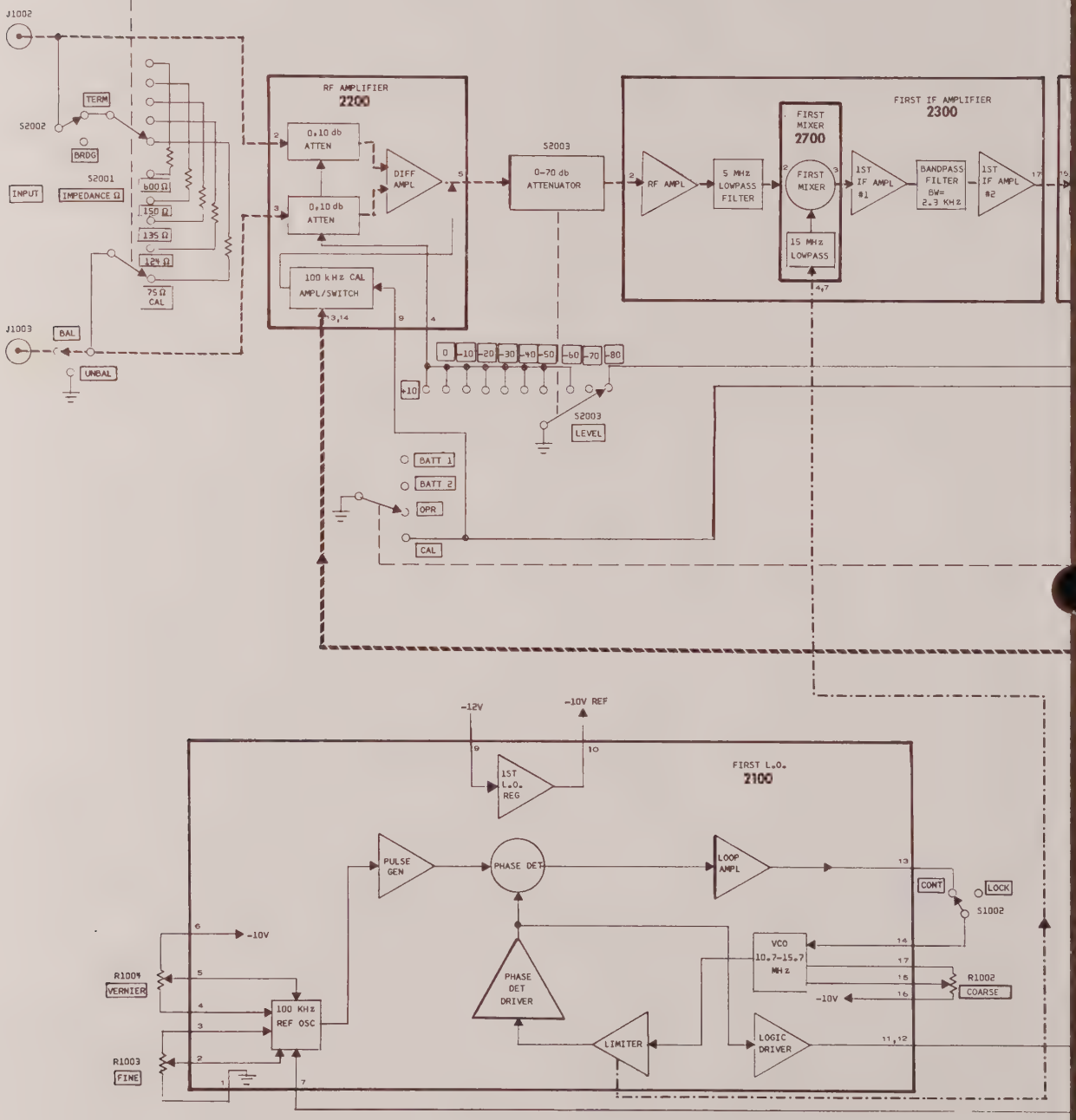
1.68 LED Display. 3200

1.69 The LED display is mounted on this board along with the OVERFLOW and the STANDBY indicators. When the RESOLUTION switch is placed in the center, STDBY, position, the +Vcc is removed from the LED display and the counter circuits and the STDBY light comes on. Since the LED's and counter place the heaviest load on the battery, the battery charge may be conserved by keeping the switch in STDBY whenever frequency readings are not being taken. This applies to battery operation in field use.

1.70 N-Carrier Adapter.

1.71 The N-Carrier Adapter is a plug-in accessory to the CE-24A or the CE-24. It is equipped with coaxial plugs to fit the CE-24A input. It has a WE20 connector which mates with a WE20C interconnecting cord to connect to N-Carrier repeaters or terminals. It also has a set of banana jacks through which level measurements may be made while the adapter is still connected to the CE-24A and the N-Carrier equipment.

1.72 A rotary switch selects the circuits to be measured in the N-Carrier equipment. When placed in the INPUT position the banana jacks are connected to the CE-24A input and all the other circuits are disconnected. In the OFF position all the input circuits are disconnected and the input to the CE-24A is shorted.


J1002
TERM
S2002
BRDG
INPUT
S2001
IMPEDANCE Ω
600 Ω
150 Ω
135 Ω
124 Ω
75 Ω CAL
J1003
BAL
UNBAL
RF AMPLIFIER
2200
0,10 db ATTEN
0,10 db ATTEN
DIFF AMPL
100 kHz CAL AMPL/SWITCH
S2003
0-70 db ATTENUATOR
RF AMPL
5 MHz LOWPASS FILTER
FIRST MIXER
2700
FIRST MIXER
15 MHz LOWPASS
FIRST IF AMPLIFIER
2300
1ST IF AMPL #1
BANDPASS FILTER BW= 2.3 KHz
1ST IF AMPL #2
0 -10 -20 -30 -40 -50 -60 -70 -80
+10
S2003
LEVEL
BATT 1
BATT 2
OPR
CAL
-12V
-10V REF
1ST L.O. REG
FIRST L.O.
2100
PULSE GEN
PHASE DET
LOOP AMPL
CONT
LOCK
S1002
-10V
R1004
VERNIER
100 KHz REF OSC
R1003
FINE
PHASE DET DRIVER
VCO 10.7-15.7 MHz
R1002
COARSE
LIMITER
LOGIC DRIVER

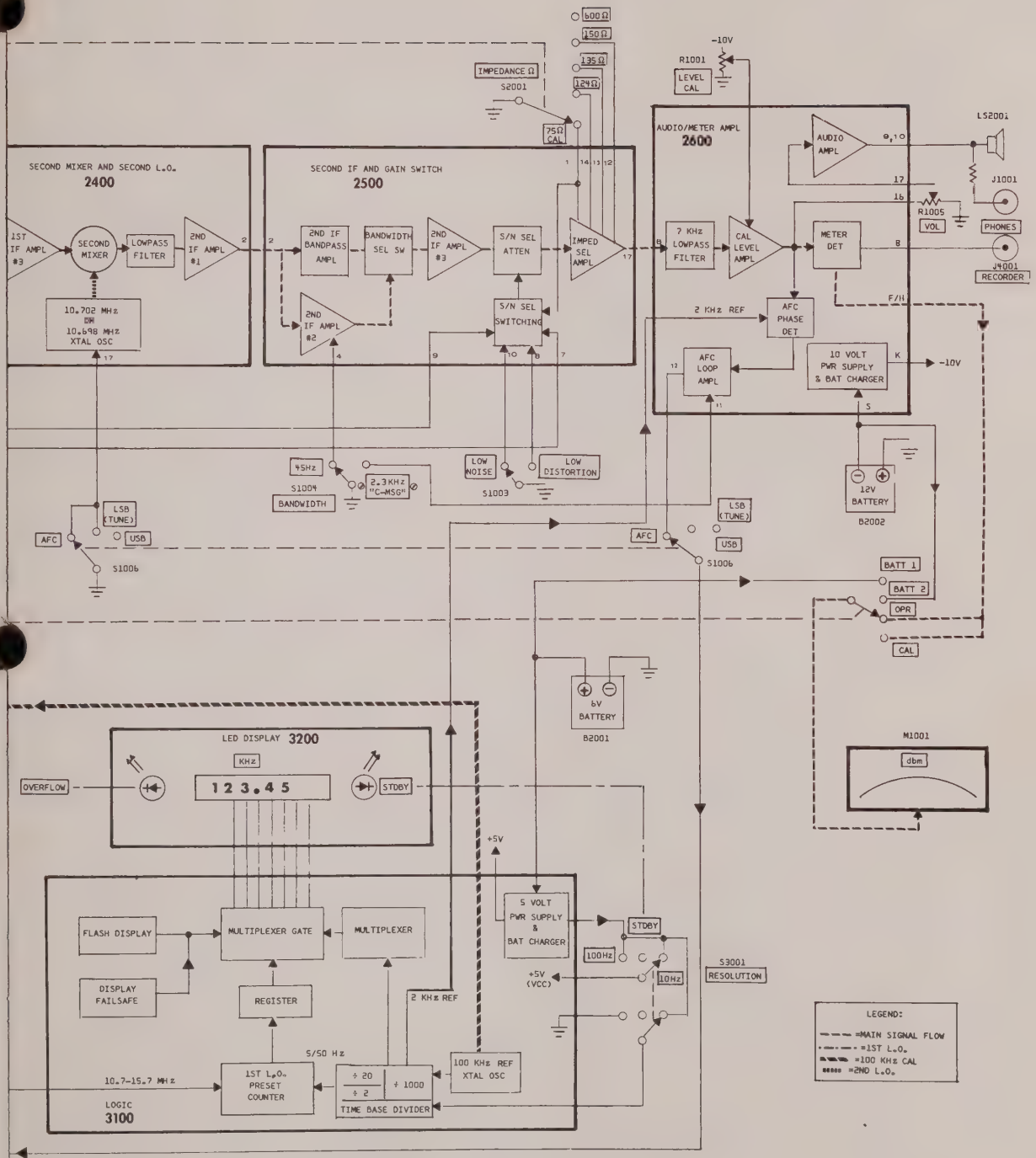


Figure 1-2. CE-24A Block Diagram

SECTION 2
MAINTENANCE

GENERAL

2.01 This section provides the information necessary to maintain the Cushman CE-24A in proper operating condition. The Performance Check may be used for incoming inspection or for determining whether or not the instrument is in need of calibration. The CE-24A may be recalibrated as necessary using the Calibration and Adjustment procedures given.

2.02 If the Calibration and Adjustment procedures do not correct the trouble and if the cause of the problem is not apparent or readily repairable, it is recommended that the Cushman Electronics Customer Service Department be contacted for further information or to make arrangements to ship the instrument to the factory or a service center for repair.

PREPARATION FOR RESHIPMENT

2.03 It is recommended that the shipping box and foam packaging be kept in case it becomes necessary to return the instrument to the factory or service center for service or repair.

2.04 The following paragraphs contain a general guide for repackaging of the instrument for shipment.

1. Attach a tag to the instrument identifying the owner, and indicate the service or repair to be made. Include the model number and full serial number of the instrument. In any correspondence, identify the instrument by model and serial number.

2. Place the instrument in the original container. Make certain that the container is well sealed with strong tape.

3. If the original container is not used, wrap the instrument in plastic or heavy paper before placing in an inner container.

4. Place packing material around all sides of the instrument.

5. Place the instrument and inner container in a heavy carton and seal with strong tape.

6. Mark the shipping container: "DELICATE ELECTRONIC INSTRUMENT", "FRAGILE".

NOTE

Both of the battery connectors must be disconnected before shipping the CE-24A.

SERVICE OR REPAIR

2.05 In the event that service or repair is required, contact:

Cushman Electronics, Inc.
Customer Service Department
2450 N. First Street
San Jose, California 95131
Telephone: (408) 263-8100
TWX: 910-338-0556

2.06 Cushman Electronics repair service is also available at the following service centers:

Reshal Associates, Inc.
219 West University Drive
Arlington Heights, Illinois 60004
Telephone: (312) 398-7660
TWX: 910-687-2824

Tele-Radio Systems, Ltd.
301 Supertest Road
Downsview P.O.
Toronto, Ontario, Canada M3J 2M4
Telephone: (416) 661-3221
TWX: 610-492-2384

Tele-Radio Systems, Ltd.
11567 160th Street
Edmonton, Alberta, Canada T5M 3V9
Telephone: (403) 451-2143
TWX: 610-831-2896

PERFORMANCE CHECK

2.07 The equipment listed below or the equivalent may be used:

Signal Generator	CE-26A
Frequency Counter	Dana 8020
40 dB Fixed Attenuator	Texscan FP-75

2.08 Set the CE-24A controls as listed below. This is the basic setup. Any changes will be indicated in the various steps.

AC Power Cord	Connected to AC line
BATT/OPR/CAL	OPR
INPUT	UNBAL
IMPEDANCE	75Ω, TERM
LEVEL	-40 dBm (Blue) CAL
NOISE-DISTORTION	LOW NOISE
BANDWIDTH	2.3 kHz
AFC/LSB/USB	LSB (Tune)
VOL	MEASURE
AC SWITCH	PUSH OFF
LOCK/CONT	LOCK
RESOLUTION	10 Hz
FREQUENCY	101.00 kHz

2.09 Preparation for Performance Checks

a. The batteries should be fully charged before conducting any of the performance checks. Connect the CE-24A to the AC power source and push in the Power switch on the front panel to the off position. Leave on charge for at least 14 hours.

2.10 Turn on the CE-24A by pulling out VOL control knob. Allow the instrument to warm up for a short time before performing any of the tests. Do not remove covers.

2.11 Cal Level Check

a. Set CE-26A to 101.00 kHz and 0.0 dBm 75Ω. Connect to CE-24A.

b. Set CE-24A BATT/OPR/CAL switch to OPR and tune CE-24A to 101.00 kHz. Switch AFC/LSB/USB switch to AFC.

c. Check that CE-24A acquires and holds the CE-26A signal and that the CE-24A level reads 0.0 dB ± 0.1 dB.

2.12 Frequency Cal Range

a. Leave controls set as in previous step.

b. Using a non-metallic screwdriver, check that the FREQ CAL range will go from less than 100.35 kHz to greater than 101.35 kHz.

c. Set BANDWIDTH switch to 45 Hz.

d. Adjust FREQ CAL for 100.00 kHz.

2.13 Frequency Range

a. Set RESOLUTION to 100 Hz. Set to LSB (Tune).

b. Tune COARSE control for maximum frequency. Should read at least 5.5 MHz.

c. Tune COARSE control for minimum frequency. Should read a flashing display of 9600.0 or less (-400 kHz).

d. Set FINE control to maximum CCW position and set COARSE control for a reading of 80 kHz ± 5 kHz. Note frequency.

e. Tune FINE control maximum CW. Frequency should read ≥210 kHz.

f. Check that VERNIER control has a range of approximately 200 Hz.

2.14 Attenuator Check

a. Set CE-26A to 100 kHz and leave it connected to the CE-24A. Set CE-24A BANDWIDTH to 45 Hz and carefully tune for maximum meter reading. Use CAL Level control to set meter to 0.0 dB. Switch to AFC.

b. Check LEVEL in 10 dB steps from +10 dBm to -80 dBm in LOW NOISE (blue figures), with CE-26A. Use fixed attenuators to extend range of CE-26A. CE-24A meter should read 0.0 dB ± 0.2 dB at each step, taking into account any fixed attenuator error.

c. In the same manner as above check the LEVEL in 10 dB steps from -10 dBm to -100 dBm in LOW DISTORTION (black figures) with the CE-26A. Use fixed attenuators to extend range of CE-26A. CE-24A meter should read 0.0 dB ± 0.2 dB at each step.

2.15 Frequency Response

a. Set the CE-26A and the CE-24A to -40 dBm. Set CE-24A to LOW NOISE and set meter to 0.0 dB using CAL control. Both instruments are still set to 100 kHz.

b. Set both instruments to 2 MHz. Check that CE-24A meter reads 0.0 dB ±0.2 dB.

c. Set both instruments to 4 MHz. Check that CE-24A meter reads 0.0 dB ±0.2 dB.

d. Set both instruments to 5 MHz. Check that CE-24A meter reads 0.0 dB ±0.2dB. Disconnect CE-26A.

2.16 Power Supply

a. Set BATT/OPR/CAL switch to CAL, FREQUENCY to 100.00 kHz.

b. Tune for maximum indication on the meter and adjust LEVEL/CAL control for 0.0 dB on the meter.

c. Switch to 45 Hz BANDWIDTH and very carefully tune for maximum meter indication. Meter should read 0.0 dB ± 0.1 dB. Note frequency and level.

d. Unplug the line cord and check that there is no change in LEVEL from the frequency noted above.

e. Switch to BATT 1 and BATT 2. The meter should read above 0.65 on the 1.0 volt scale.

f. Reconnect AC cord to line.

2.17 Audio Output

a. Set controls as in paragraph 2.16 except set BANDWIDTH switch to 2.3 kHz.

b. Turn volume control fully clockwise. A high pitched tone should be heard. Turn VOL back to MEASURE.

2.18 Miscellaneous Checks

a. Set RESOLUTION switch to STDBY. Check that STDBY light comes on.

b. Check that decimal point lights properly in both 10 Hz and 100 Hz RESOLUTION positions.

c. Set RESOLUTION switch to 10 Hz. Tune COARSE for 1 MHz. Check that overflow light comes on.

d. Set LOCK/CONT switch to CONT. Check that COARSE tunes continuously over the full range. Set LOCK/CONT switch back to LOCK.

ADJUSTMENT PROCEDURE

2.19 Preparation for Adjustment

a. The batteries should be fully charged before beginning adjustment procedures. Connect the CE-24A to the AC power source and push in the Power switch on the front panel to the OFF position. Leave on charge for at least 14 hours.

b. Remove top and bottom covers. Remove shield cover over the 3100, 3200 circuit boards.

CAUTION

Whenever removing or replacing a circuit board be sure to remove the battery fuses and disconnect the line cord. Power supply checks must be made with the batteries connected. For the remainder of tests the unit may be operated on AC with the battery fuses removed.

c. The following test equipment, or the equivalent, is required:

Signal Generator	CE-26A
Frequency Selective Levelmeter	CE-21A or CE-24A
DVM	Dana 4700
AC VTVM	HP 400FL
Frequency Counter	Dana 8020
(2) 20 dB Fixed Attenuators	Texscan FP-75

d. Set the CE-24A controls as listed below:

BATT/OPR/CAL	CAL
INPUT	UNBAL
IMPEDANCE	75Ω, TERM
LEVEL	CAL (-40 dBm, Blue)
NOISE/DISTORTION	LOW NOISE
BANDWIDTH	2.3 kHz
AFC/LSB/USB	LSB (Tune)
VOL	MEASURE
AC SWITCH	PULL ON
LOCK/CONT	LOCK
RESOLUTION	10 Hz
FREQUENCY	100.00 kHz
AC CORD	To AC supply

2.20 Power Supply Adjustment

a. Remove both battery fuses. Raise the 2600 board on the extender board. (Board numbers are stamped on bottom of board pocket.) See Figure 2-1.

b. Connect DVM to pin 1, J7, on board 3100. Set RESOLUTION switch to STDBY. Turn on CE-24A. Adjust R3123 for +7.2V ± .05V. See component identification drawing, Figure 3-12, for jack and adjustment control locations.

c. Connect DVM to pin 1, J8, on board 3100. Adjust R3126 for +5.1V ± .05V. Repeat steps b. and c. until no further adjustments are necessary.

d. Set RESOLUTION switch to 10 Hz and set FREQUENCY to 888.88 kHz. Voltage at pin 1, J8, should be between +4.85 and +5.10V DC.

e. Turn off CE-24A. Connect DVM to lower end of R2646 (two 10Ω resistors in parallel). Voltage should read 14.40V ± .05V. Adjust R2644 for this voltage if necessary.

f. Connect DVM to pin k on 2600 board. Turn on CE-24A and allow voltage to stabilize. Adjust R2659 for -10.000V DC ± .001V. Turn off CE-24A, reinstall 2600 board and battery fuses in CE-24A.

g. Turn on CE-24A. Disconnect AC power cord from AC source. Set BATT/OPR/CAL to BATT 1 and then to BATT 2. Both should read in the blue area on the meter. A fully charged battery should read approximately 0.75V on the 1V scale. Reconnect AC power and remove battery fuses for remainder of test if desired. Be sure to observe CAUTION of 2.19 b. if fuses are left in circuit.

2.21 First L.O. Frequency Range Adjustment. 2100

a. Raise 2100 board on extender.

b. Set controls as in paragraph 2.19 d. except set RESOLUTION to 100 Hz. Turn the COARSE tuning control from max CCW to max CW and note frequency range. Range should be at least from -400 kHz to 5500 kHz. (-400 kHz is a flashing display of 9600.00 kHz). Adjust L11 if necessary to obtain this range.

c. Set COARSE control to approximately 100.00 kHz.

d. Tune FINE control from max CCW to max CW. Range should be approximately from 80 kHz to 210 kHz. (COARSE control may have to be retuned to bring FINE control into proper range). If necessary adjust R52 to give a total range of 130 kHz ± 500 Hz.

e. Set COARSE and FINE controls for a frequency of 100 kHz. Set RESOLUTION to 10 Hz. Adjust VERNIER control from max to min. Range should be 200 Hz ± 50 Hz.

2.22 ~~100 kHz~~ Oscillator. 2100

a. Set controls as in 2.19 d. Using a X10 probe, connect the oscilloscope to the junction of L6 and C37. Should display a sine wave greater than 8V p-p with a period of 10 μsec. Disconnect oscilloscope.

b. Set FINE control fully CCW. (RESOLUTION still set to 10 Hz.)

c. Adjust COARSE control. Frequency should change in 100 kHz steps ± .1 kHz. If increments are much greater, screw in the adjustment of L6 to change the frequency by 100 kHz and recheck tuning. If further adjustment is necessary adjust L6 either in or out for a frequency change of 100 kHz until minimum variation from 100 kHz steps is noted as the COARSE control is tuned.

d. Set COARSE control for 80 kHz. Tune FINE for a frequency of 100 kHz. Tune COARSE control. Frequency should change in 100 kHz steps ± .1 kHz.

e. Check FINE range. Should be from 80 kHz to 214 kHz ± 5 kHz.

f. Replace 2100 board in CE-24A.

2.23 Second LO Frequency Adjustment. 2400

a. Set controls as in 2.19 d. and elevate 2400 board on extender.

b. Connect X1 scope probe to TP1 and adjust L7 for maximum amplitude.

c. Set AFC/LSB/USB switch to LSB. Connect counter to TP1. Set counter Time Base to 100 msec.

d. Adjust L5 for a counter reading of 10.69800 MHz ± 20 Hz. (If signal tends to drop out before correct frequency is reached, back up on adjustment and go to the following step.)

e. Set AFC/LSB/USB to USB. Adjust R20 for 10.70200 MHz ± 20 Hz. Alternate between steps c. and d. until the correct frequencies are reached. Should converge rapidly.

f. Connect oscilloscope to TP1. Waveform should be greater than 0.9V P-P. Replace 2400 board.

2.24 Counter Calibration

a. Set controls as in 2.19 d.

b. Tune for a maximum indication on the meter. Switch to AFC. Check that AFC is working by slightly adjusting FINE control and noting that there is no change in Frequency reading.

c. With a non-metallic tool adjust Frequency reading for 100.00 kHz.

2.25 First Mixer Balance. 2700

a. Set controls as in 2.19 d., except set BATT/OPR/CAL switch to OPR. Shield cover must be over 2700 board with adjustment toward front. Tune Frequency to 0000.00 kHz. If meter goes off-scale, tune for an on-scale reading and start adjustment as given in next step.

b. Alternately adjust the two Mixer Bal controls (C5, R3) for minimum meter reading. A reading of less than -5 dB on the meter scale at 0000.00 kHz should be obtained.

2.26 Second IF Gain Adjustment. 2500

a. Set controls as in 2.19 d. Elevate 2500 board on the extender.

b. Set CAL LEVEL control to mid-range and tune for maximum meter indication.

c. Set AFC/LSB/USB switch to AFC. Adjust R18 for zero dB on the meter.

NOTE: Steps d-h should be performed only if the 45 Hz filter is known to be out of spec.

d. Set BANDWIDTH to 45 Hz. Connect AC VTVM to TP1.

e. Adjust L1 for a null. Adjust L2 for a peak. Adjust L3 for a null. Adjust in this order and repeat two times. Note le

f. Now adjust L2 for a peak reading. Note difference between this reading and the one taken in the previous step.

g. Adjust L2 in the opposite direction to the level noted in e. plus 1/2 the difference noted in f. Then adjust both L1 and L3 for a null.

h. Repeat e. through g. until the lowest null is obtained in step g.

i. Adjust R6 for a zero dB reading on the CE-24A meter. Replace 2500 board in CE-24A.

2.27 CAL Source Calibration

a. Set the CE-24A controls as in 2.19 d., except set BATT/OPR/CAL switch to OPR. Set LEVEL CAL control to mid-range.

b. Set CE-26A to 100.10 kHz, 75Ω and connect the UNBAL input of CE-24A.

c. Tune for maximum reading on the CE-24A and adjust R2518 for a zero dB reading on the CE-24A.

d. Disconnect CE-26A from CE-24A. Set BATT/OPR/CAL switch to CAL, and tune to 100.00 kHz. Adjust R2236 for a zero dB reading on the CE-24A meter.

e. Switch RESOLUTION to STDBY. Meter should still read 0.00 dB ± 0.03 dB. If not, adjust L3101 until there is no variation between the readings.

f. Connect DVM to RECORDER output on CE-24A rear panel. Tune for zero dB in CAL mode. DVM should read -1.0V ± .05V. Adjust R2608 for this reading.

2.28 CMR Adjustment and Frequency Response

a. Set the CE-24A as in 2.19 d., except set BATT/OPR/CAL to OPR and set LEVEL to -70 dBm. Set CE-26A to -70 dBm (use fixed 20 dB attenuator) and connect to UNBAL input of CE-24A. Adjust CAL LEVEL control for 0.0 dB on meter.

b. Set CE-24A and CE-26A to 5 MHz. Adjust C2205 for -0.1 dB ± .05 dB on meter. (If this setting cannot be achieved the Low Pass Filter on First IF Amplifier board is misadjusted.) (See paragraph 2.30).

c. Set CE-24A and CE-26A to -60 dBm at 100 kHz and set CAL LEVEL control for 0.0 dB on the meter.

d. Set CE-24A and CE-26A to 5 MHz. Adjust C2203 for -0.1 dB on meter.

e. Set CE-26A to -36 dBm. Attach BNC Tee to CE-26A and connect two equal lengths of 75Ω coax to Tee and connect other ends to BAL input on CE-24A. Set INPUT to BAL. Adjust C2211 for a minimum meter reading. Reading should be less than -65 dBm. Remove BNC Tee and two cables. Repeat steps b. through e.

f. With CE-26A connected to the CE-24A UNBAL input, set the CE-26A to -50 dBm at 100 kHz. Adjust CE-24A LEVEL CAL control for 0.0 dB on the meter.

g. Set both CE-26A and CE-24A to 5 MHz. Adjust C2004 (adjustment nearest front panel under front end of instrument, accessible through the attenuator shield) for -0.1 dB on the meter.

h. Set both the CE-26A and CE-24A to -30 dBm at 100 kHz. Adjust LEVEL CAL control for 0.0 dB on the meter.

i. Set both the CE-26A and CE-24A to 5 MHz and adjust C2005 (rear adjustment accessible through attenuator shield) for -0.1 dB on the meter.

2.29 45 Hz Bandpass Filter Test and Equalization

a. Set the CE-24A controls as in paragraph 2.19 d. except set BANDWIDTH to 45 Hz, LOW NOISE/DISTORTION to LOW DISTORTION, LEVEL to -10 dBm and BATT/OPR/CAL to OPR.

b. Put covers on instrument and allow it to warm up for at least one hour.

c. Set the CE-26A to 100 kHz and connect to the UNBAL input of the CE-24A. Check for a bandwidth of 45 Hz ± 5 Hz by adjusting the FINE control and observing the frequency on the CE-24A.

d. Set CE-24A to -60 dBm and check 60 dB bandwidth for 450 Hz.

e. Remove CE-26A. Set CE-24A BANDWIDTH to 2.3 kHz and set AFC/LSB/USB to AFC. Adjust LEVEL CAL control for 0.0 dB on the meter.

f. Switch BANDWIDTH to 45 Hz and adjust R2506 for 0.00 dB on the meter.

2.30 First Mixer Low Pass Filter Adjustment

a. Special equipment is required for this adjustment. It should not be attempted unless the proper equipment is available.

b. Equipment required (or equivalent):

Spectrum Analyzer	HP 8553B
Level Meter of Signal Generator - TTS	Siemens 2021

c. Set controls as in 2.19 d., except set Frequency to 4192.5 kHz and BATT/OPR/CAL switch to OPR. No signal connected to INPUT.

d. Elevate board 2300 on the extender. Remove shield from First Mixer (mounted on 2300 board) by removing 2 flat head screws.

e. Use a minimum of 40 dB in the Spectrum Analyzer RF Attenuator. Connect input of Spectrum Analyzer to TP2701 (on the First Mixer), using RG55 coax cable with alligator clips.

f. Set Spectrum Analyzer so that 29.785 MHz (second harmonic of the first LO) is in the center of the screen. Then adjust L2701 (in Mixer) for a minimum level. Should be less than -40 dB with respect to First LO. Disconnect Spectrum Analyzer from TP2701. Replace shield on mixer.

2.31 Low Pass Filter Alignment

a. With the CE-24A set up as in the previous step connect Signal Generator to INPUT, 75Ω, UNBAL. Set Signal Generator to 0 dBm at 10.7 MHz. Signal Generator and Levelmeter to be connected together as a TTS system.

b. Remove jumper between TP3 and TP6 (on 2300 board) and connect Levelmeter to TP6, using RG55 cable and alligator clips. Connect shield to ground plane on the board.

c. Set CE-24A Frequency to 5000.0 kHz, LEVEL to -90 dBm, LOW DISTORTION/LOW NOISE to LOW DISTORTION and AFC/LSB/USB to AFC.

d. Set L3, L4, L5 to minimum inductance (slugs out slightly through bottom of board).

e. Adjust L4 for a minimum reading. Should be at least 80 dB below the input level.

f. Set Signal Generator to 13.033 MHz. Adjust L5 for a minimum reading. Should be at least 80 dB below the input level.

g. Set the Signal Generator and the CE-24A to -90 dBm at 5000.0 kHz. Replace jumper between TP3 and TP6 and adjust L3 for a maximum reading on the CE-24A meter. Remove test equipment and replace 2300 board in CE-24A.

TROUBLESHOOTING

2.32 A list of front panel indications of trouble and their possible causes is given below to aid in localizing trouble to a particular area of the instrument. For further aid in troubleshooting, perform the adjustment procedure while studying the theory of operation applying to that section of the instrument. This will aid in localizing the trouble to some part of a board. Suspected components can then be checked and substituted to clear the trouble.

2.33 If these procedures fail to produce proper results, call Cushman Electronics, Inc. Customer Service Department at the address listed in paragraph 2.05 for further information or to make arrangements to ship the instrument to the factory or a service center for repair.

Table 2-1. Troubleshooting Chart

INDICATED TROUBLE	POSSIBLE CAUSE
No meter reading in BATT positions. (Not connected to AC source)	Instrument not turned on. Batteries not connected. Fuse blown.
Meter reading low in BATT positions after 12 hour charging cycle. (Not connected to AC source)	AC fuse blown so not charging when connected to AC. Defective Batteries. Trouble in AC power supply circuits.
BATT indications ok but no Frequency display.	RESOLUTION switch in STDBY.
Will not hold Frequency in AFC	AFC Phase Detector or Loop Amplifier on 2600 board.
Unable to CAL Receive ok	100 kHz CAL AMPL/SWITCH board 2200
Unable to calibrate or receive	Power Supply, RF Ampl. board, First Ampl. Second Mixer and Second L. O., Second I. F., Audio/Meter Ampl.
Receive ok but improper Frequency display	Logic board, 3100, or First LO board, 2100
Receive ok but no Audio	Audio Amplifier on 2600 board. Speaker open.
Improper or no readings in one or more impedance switch positions.	Defective resistor or open connection in impedance selector circuits.
Improper or no readings in some positions of the level switch	Defective resistor or open connection in attenuator circuits.

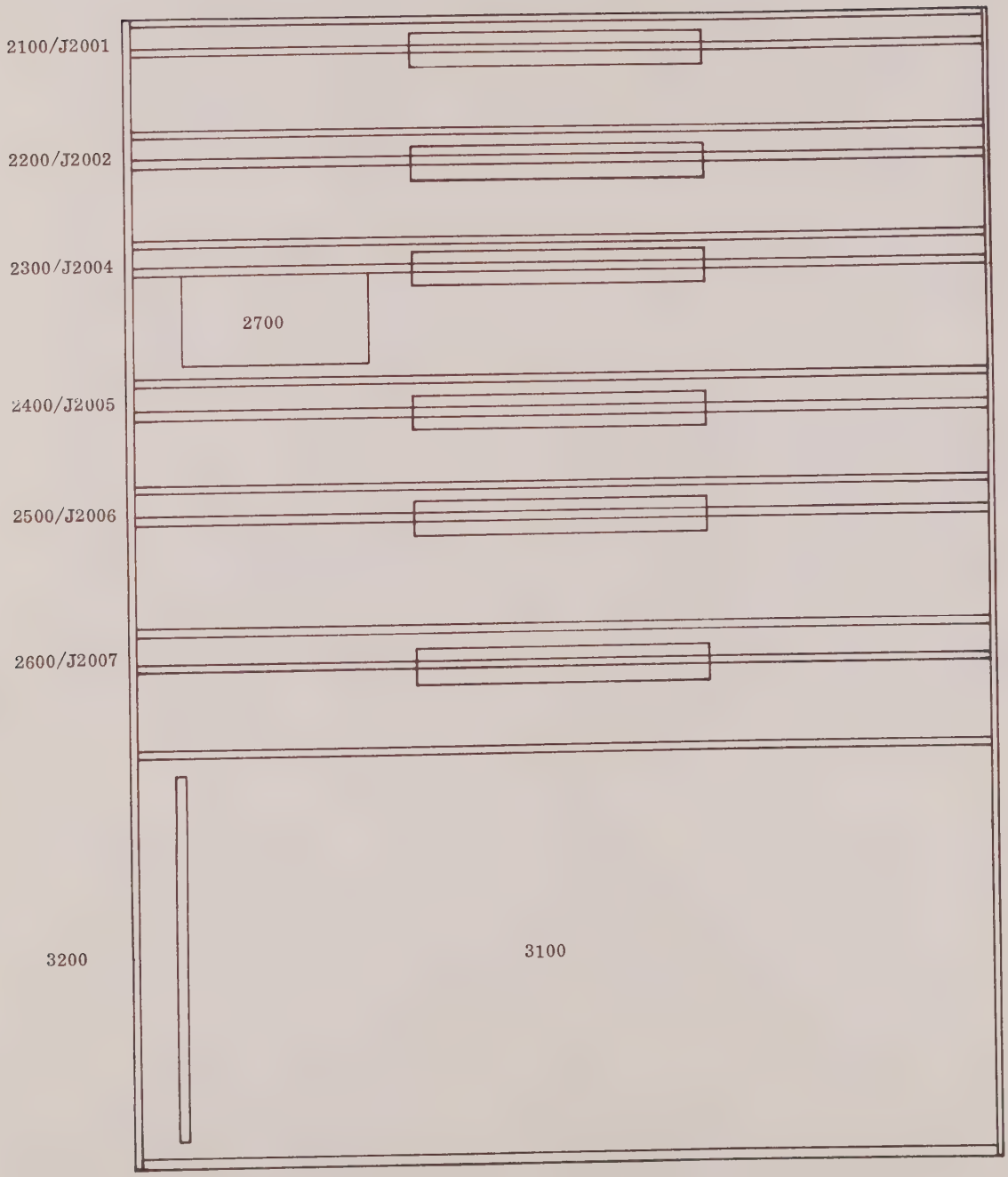


Figure 2-1. CE-24A Circuit Board Location

SECTION 3
PARTS LISTS AND SCHEMATIC DIAGRAMS

INTRODUCTION

3.01 The following parts list and schematic diagrams have been arranged in order accordingly to the Circuit Reference Series numbers. Refer to paragraph 1.02. Each parts list and schematic diagram is identified with this number. The circuit boards in the instrument are stamped with an identifying circuit board number. See Cross Reference Table 3-1 below.

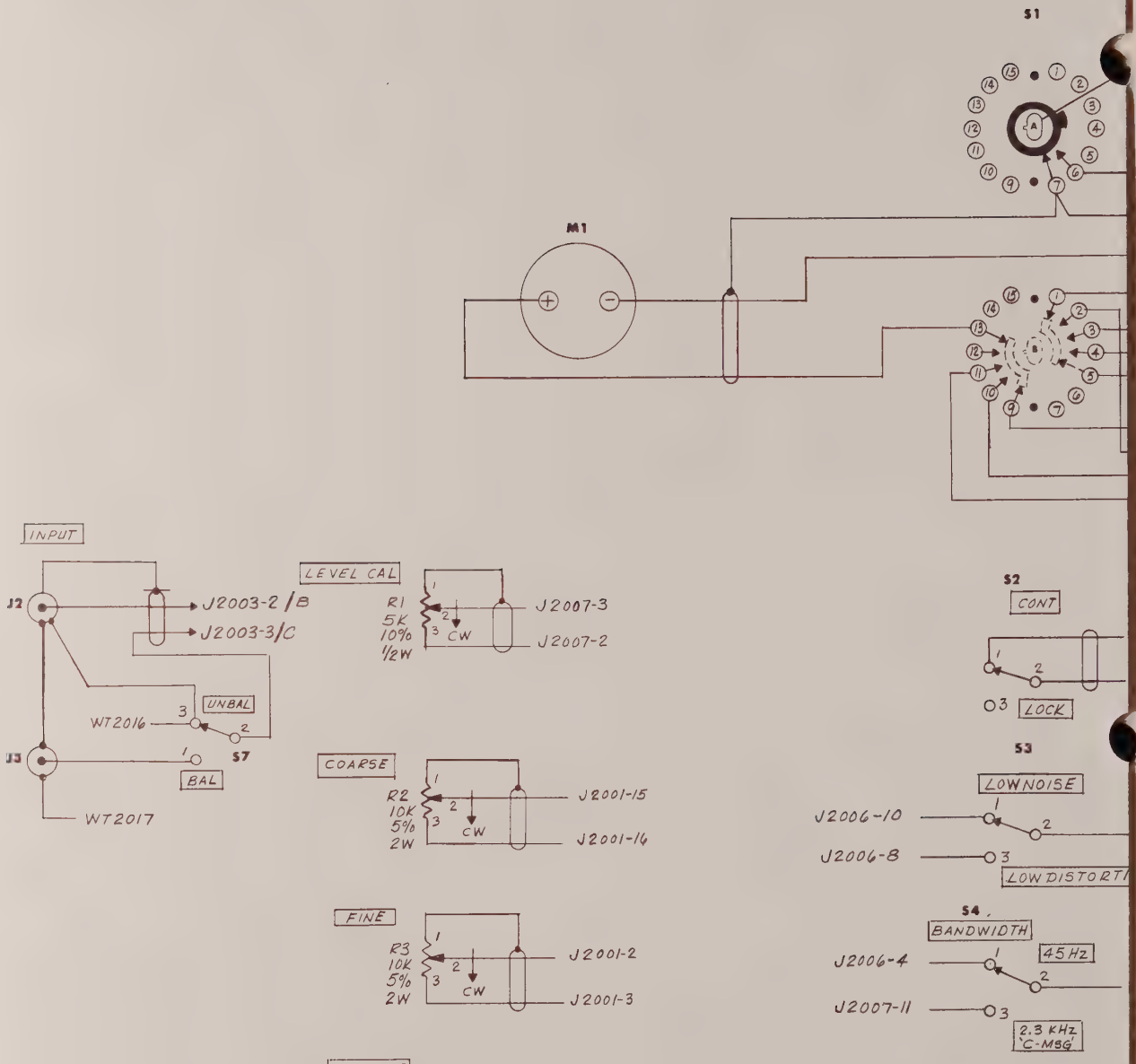
3.02 Parts list pages are grouped with the schematic diagrams to which they refer. Component identification drawings showing the location of the individual components on the circuit boards are placed in the inner sheet of the schematic diagram to which they apply.

Table 3-1. Printed Circuit Board and Circuit Reference Numbers Cross Reference

Ckt. Bd. No.	Circuit Title	Ckt. Ref. No.	Assembly No.	Figure No.
1780-0475	R.F. Amplifier	2200	7001-0247	3-5
1780-0746	1st I.F. Amplifier	2300	7001-0248	3-6
1780-0477	2nd Mixer and 2nd L.O.	2400	7001-0249	3-7
1780-0478	2nd I.F. and Gain Switch	2500	7001-0250	3-8
1780-0479	Audio/Meter Amplifier	2600	7001-0251	3-9
1780-0480	1st L.O.	2100	7001-0246	3-4
1780-0481	L.E.D. Display	3200	7001-0453	3-14
1780-0482	Logic	3100	7001-0452	3-12/13
1780-0483	P.C. Board Extender	0000	7001-0254	----
1780-0484	1st Mixer	2700	7001-0256	3-10
---------	Front Panel	1000	7003-0084	3-1
---------	Main Chassis	2000	---------	3-2/3
---------	Logic/Display Container Assy	3000	7046-0022	3-11
---------	Rear Panel	4000	7003-0085	3-15
---------	N-Carrier Adapter	----	---------	3-16

FRONT PANEL. 1000

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
1000	Front Panel Assembly	7003-0084	Cushman	
	CONNECTOR			
J1	3 Cond, Single Close Ckt	2586-0011	Switchcraft	113B
J2	Coaxial	2586-0009	Trompeter	J3DW
J3	Coaxial	2586-0009	Trompeter	J3DW
	METER			
M1	Meter, Level	1402-0031	Cushman	
	RESISTORS			
R1	Pot, 5K, ±10%, 1/2W Lin Tap	1203-0069	Allen-Bradley	WA4G0325502UA
R2	Pot, 10K, ±5%, 2W, 10T, WW	1203-0067	Spectrol	534
R3	Pot, 10K, ±5%, 2W, 10T, WW	1203-0067	Spectrol	534
R4	Pot, 5K, ±10%, 1/2W Lin Tap	1203-0069	Allen-Bradley	WA4G0325502UA
R5	P/O S5/S6 100K			
	SWITCHES			
S1	Lever, 3 pole, 4 pos	1851-0082	Cushman	
S2	Toggle, SPST, flat handle	1850-0017	C & K	7101PYZBE
S3	Toggle SPST, flat handle	1850-0017	C & K	7101PYZBE
S4	Toggle, SPST, flat handle	1850-0017	C & K	7101PYZBE
S5	P/O S6			
S6	Rotary, 3 pole, 3 pos w/pot & switch	1851-0100	Cushman	
S7	Toggle, SPST, flat handle	1850-0017	C & K	7101PYZBE
	Filter, Red Readout	4941-0023	Cushman	


S1
M1
INPUT
J2
J2003-2/B
J2003-3/C
UNBAL
WT2016
3
2
J3
1
S7
BAL
WT2017
LEVEL CAL
R1
5K
10%
1/2W
1
2
3 CW
J2007-3
J2007-2
COARSE
R2
10K
5%
2W
J2001-15
J2001-14
FINE
R3
10K
5%
2W
J2001-2
J2001-3
VERNIER
R4
5K
10%
1/2W
J2001-5
J2001-6
S2
CONT
LOCK
S3
LOW NOISE
J2006-10
J2006-8
LOW DISTORT
S4
BANDWIDTH
J2006-4
45 Hz
J2007-11
2.3 KHz
C-MSG

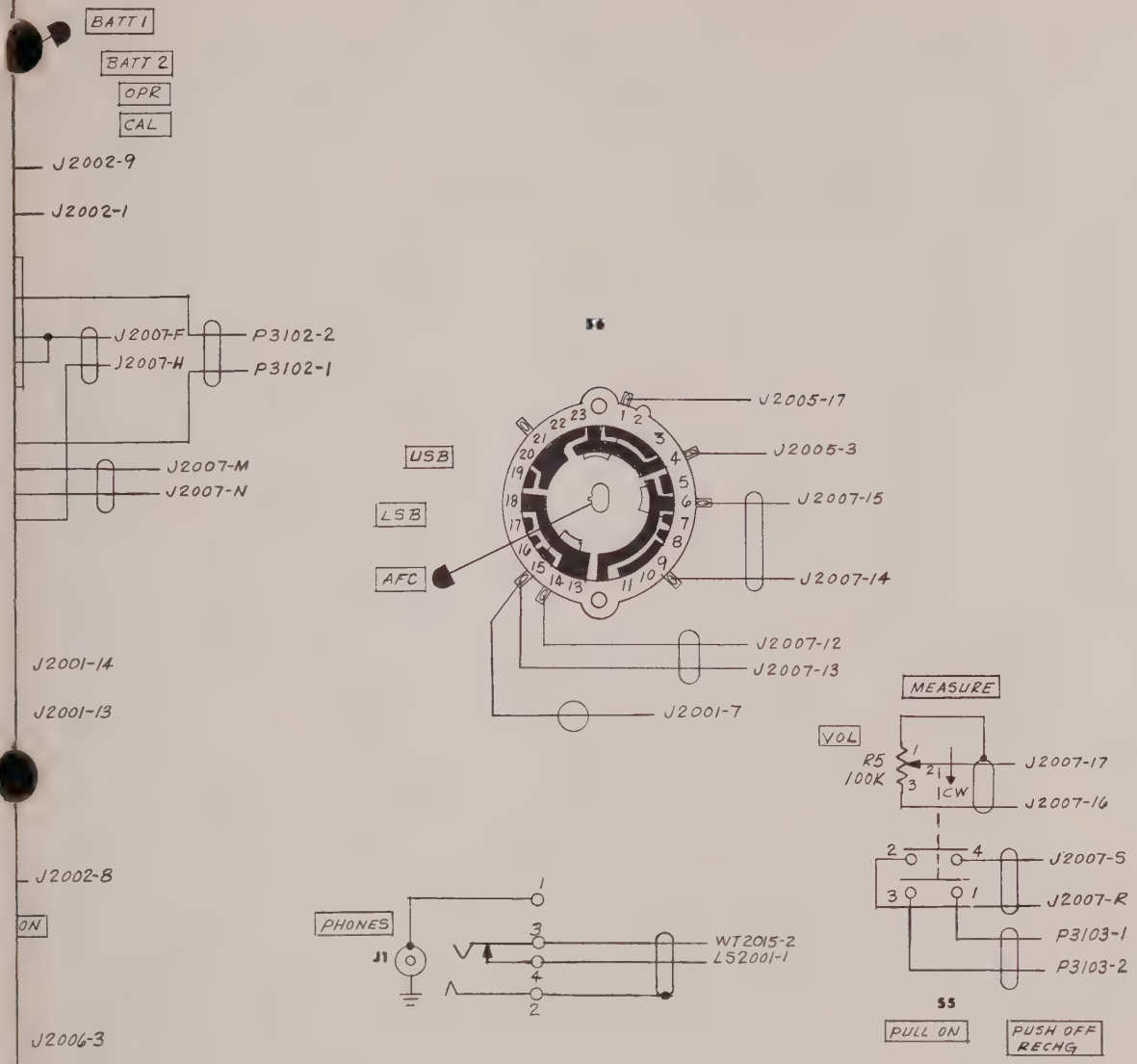
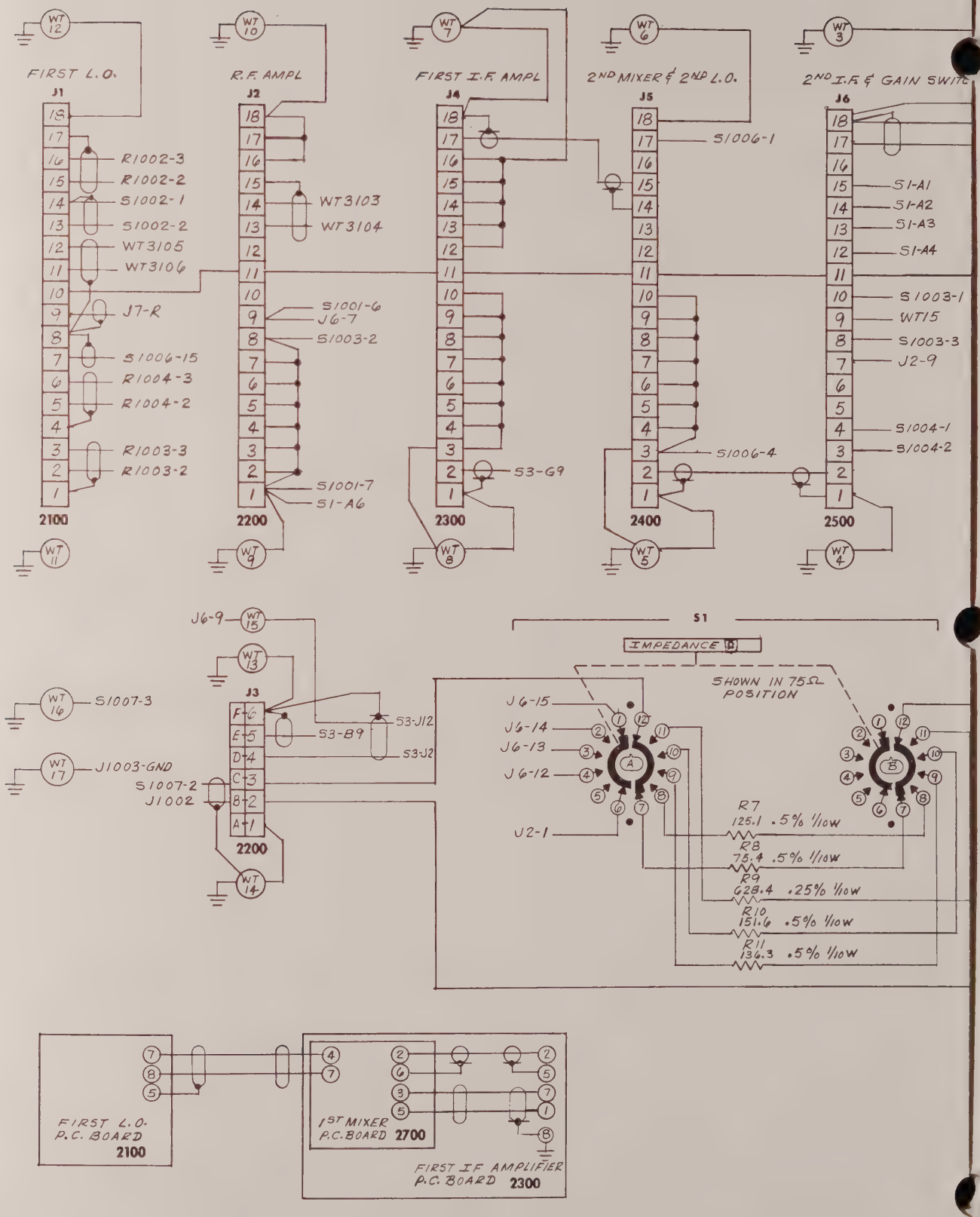


Figure 3-1. Front Panel Interconnection Diagram. 1000

MAIN CHASSIS. 2000

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
2000	Main Chassis			
	BATTERIES			
B1	6V, Rechargeable	1046-0008	Cushman	
B2	12V, Rechargeable	1046-0009	Cushman	
	CAPACITORS			
C1	Cer, 8.2pF, ±10%, NPO, 100V	1005-0104	Erie	8111-100-C0G0-829K
C2	Cer, 470pF, ±10%, 50V	1005-0105	Erie	8111-050-X7R-471K
C3	Mica, 33 pF, ±5%, 500V	1004-0006	Cornell-Dubilier	CD6ED330J
C4	Trim, 5-20pF, +50 -0% N750, 250V	1001-0014	R-Triko	107-02M5-20N750
C5	Trim, 5-20pF, +50 -0% N750, 250V	1001-0014	R-Triko	107-02M5-20N750
C6	Mica, 22pF, ±5%, 500V	1004-0003	Cornell-Dubilier	CD6ED220J
C7	Cer, 5.6pF, ±10%, NPO, 100V	1005-0111	Erie	8101-100-C0G0-569D
	CONNECTORS			
J1	18 contact, single row	2535-0028	Masterite	S014GR18SR-BX
J2	18 contact, single row	2535-0028	Masterite	S014GR18SR-BX
J3	12 contact, double row	2535-0052	Masterite	2MC6D/1-1
J4	18 contact, single row	2535-0028	Masterite	S014GR18SR-BX
J5	18 contact, single row	2535-0028	Masterite	S014GR18SR-BX
J6	18 contact, single row	2535-0028	Masterite	S014GR18SR-BX
J7	18 contact, double row	2535-0067	Viking	2VK18D/1-1
J8	2 pin plug housing, mini	2535-0068	Molex	03-09-2022
	Pins for J8	4153-0012	Molex	02-09-2118
J9	3 pin plug housing, mini	2535-0036	Molex	1625-3-P-1
	Pins for J9	4153-0006	Molex	1561TL
P1	3 pin receptacle housing, mini	2535-0035	Molex	03-06-1032
	pins for P1	4153-0007	Molex	08-50-0108
P2	2 pin receptacle housing, mini	2535-0069	Molex	03-09-1022
	Pins for P2	4153-0013	Molex	02-09-1118
	RESISTORS			
R1	MF, 990Ω, ±.1%, 25PPM, 1/8W	1074-1048	Dale	MF 1/8 T9
R2	MF, 10.1Ω, ±.1%, 25PPM, 1/10W	1074-1043	Pyrofilm	PME55 T-9
R3	MF, 683.8Ω ±.1% 25PPM, 1/10W	1074-1046	Dale	MF 1/10 T9
R4	MF, 462.5Ω, ±.1%, 25PPM, 1/10W	1074-1045	Dale	MF 1/10 T9
R5	MF, 900Ω, ±.1%, 25PPM, 1/10W	1074-1044	Dale	MF 1/10 T9
R6	MF, 111.1Ω, ±.1%, 25PPM, 1/8W	1074-1047	Dale	MF 1/10 T9
R7	MF, 125.1Ω, ±.5%, 25PPM, 1/10W	1074-0015	Dale	MF 1/10 T9
R8	MF, 75.4Ω, ±.5%, 25PPM, 1/10W	1074-0009	Dale	MF 1/10 T9
R9	MF, 628.4Ω, ±.25%, 25PPM, 1/10W	1074-0045	Dale	MF 1/10 T9
R10	MF, 151.6Ω, ±.5% 25PPM, 1/10W	1074-0017	Dale	MF 1/10 T9
R11	MF, 136.3Ω, ±.5%, 25PPM, 1/10W	1074-0016	Dale	MF 1/10 T9
R12	Comp, 51, ±5%, 1/4W	1066-5105	Allen-Bradley	CB5105
LS1	Speaker	1715-0006	Quam	25A07245
	SWITCHES			
S1	5 position rotary, concentric	1851-0083	Cushman	
S2	2 position, P/O S1			
S3	10 position rotary, 5 section	1851-0084	Cushman	


FIRST L.O.
J1
2100
R.F. AMPL
J2
2200
FIRST I.F. AMPL
J4
2300
2ND MIXER & 2ND L.O.
J5
2400
2ND I.F. & GAIN SWITC
J6
2500
R1002-3
R1002-2
S1002-1
S1002-2
WT3105
WT3106
J7-R
S1006-15
R1004-3
R1004-2
R1003-3
R1003-2
WT3103
WT3104
S1001-6
J6-7
S1003-2
S1001-7
S1-A6
S3-G9
S1006-1
S1006-4
S1-A1
S1-A2
S1-A3
S1-A4
S1003-1
WT15
S1003-3
J2-9
S1004-1
S1004-2
J6-9
S1007-3
J1003-GND
S1007-2
J1002
J3
S3-J12
S3-B9
S3-J2
S1
IMPEDANCE
SHOWN IN 75Ω POSITION
J6-15
J6-14
J6-13
J6-12
J2-1
R7
125.1 .5% 1/10W
R8
75.4 .5% 1/10W
R9
628.4 .25% 1/10W
R10
151.6 .5% 1/10W
R11
136.3 .5% 1/10W
FIRST L.O.
P.C. BOARD
2100
1ST MIXER
P.C. BOARD 2700
FIRST IF AMPLIFIER
P.C. BOARD 2300

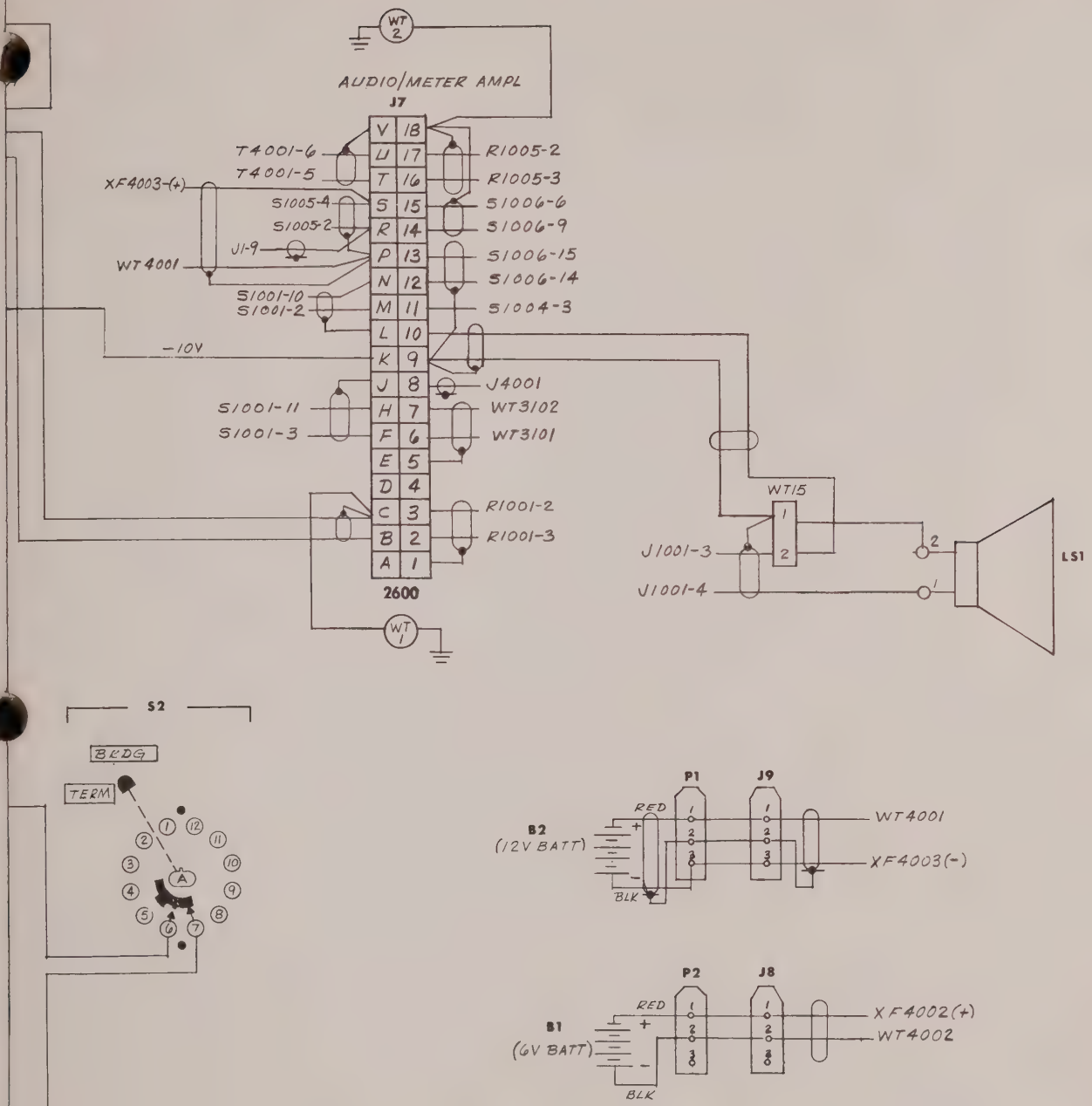
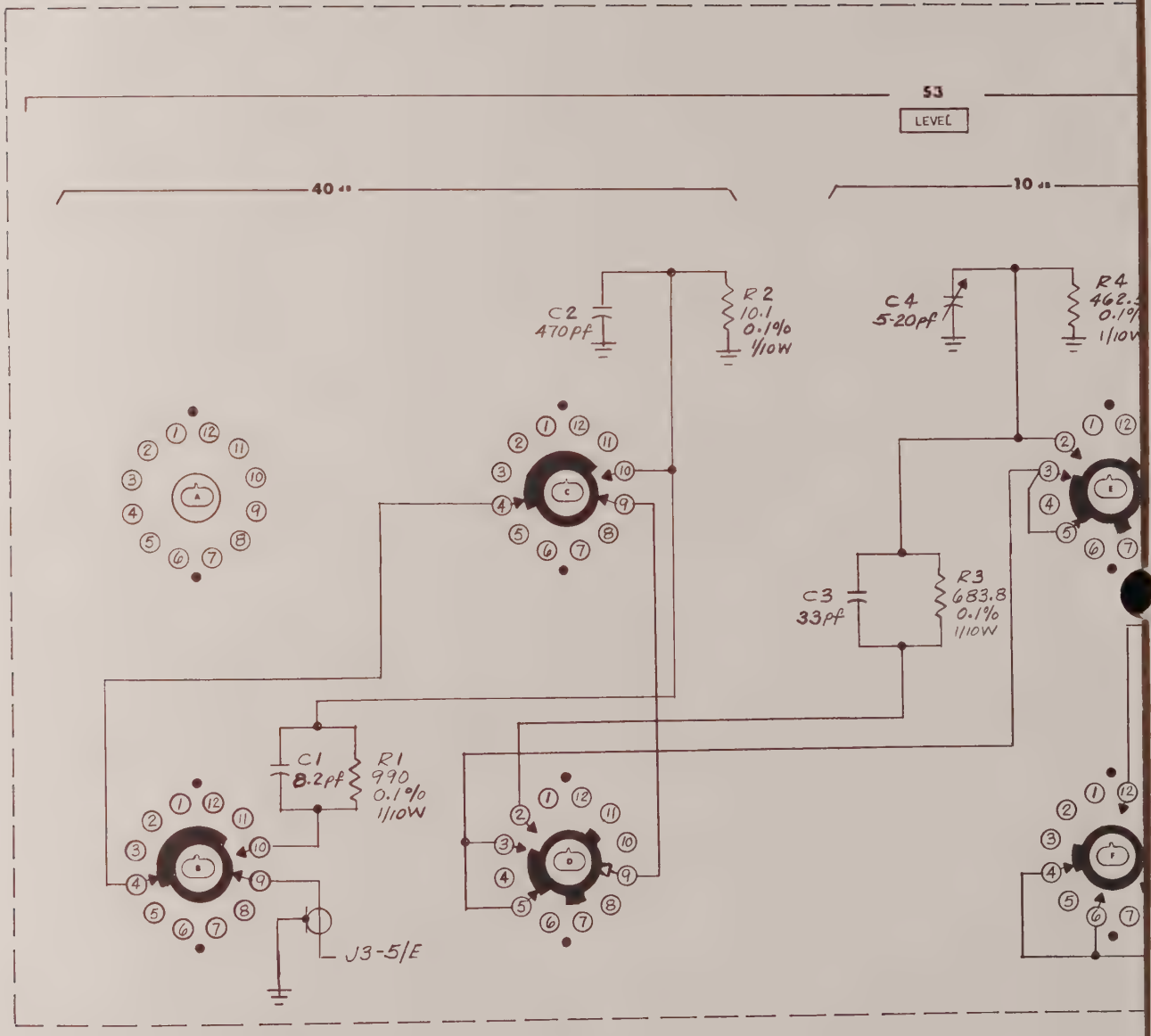


Figure 3-2. Main Chassis Interconnection Diagram, sheet 1. 2000



NOTE:

1. RESISTORS - 1/4W, 5% VALUES IN OHMS UNLESS OTHERWISE NOTED.
2. CAPACITORS - VALUES IN μF UNLESS OTHERWISE NOTED.
3. INDUCTORS - VALUES IN μH UNLESS OTHERWISE NOTED.
4. *FACTORY SELECT. TYPICAL VALUE SHOWN.
5. ALL VOLTAGES ARE DC UNLESS OTHERWISE NOTED.
6. ALL SWITCHES IN MAX CCW POSITION.

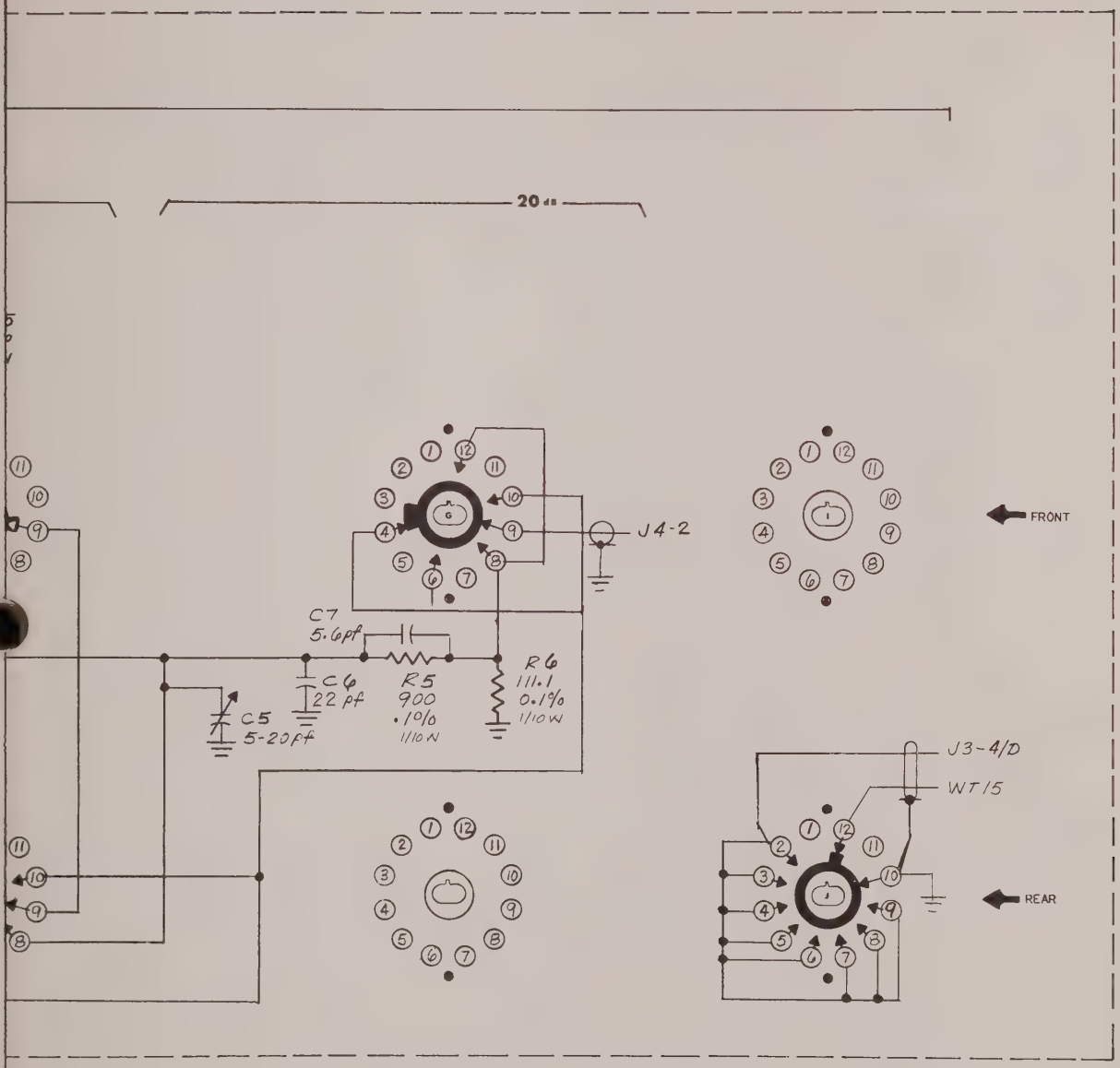


Figure 3-3. Main Chassis Interconnection Diagram, sheet 2. 2000

FIRST L. O. 2100

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
2100	1st L.O. P.C. Board Assembly	7001-0246	Cushman	
	P.C. Board	1780-0480	Cushman	
	CAPACITORS			
C1	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C2	Mica, 75pF, ±5%, 500V	1002-0025	Elmenco	DM15-E-750J
C3	Cer, 2.2pF, ±.25pF, 500V	1005-0017	Erie	301-000-C0J0-229C
C4	Tant, 1μF, ±20%, 50V	1011-0013	Kemet	T368A105M050AS
C5	Mica, 150pF, ±5%, 500V	1002-0021	Elmenco	DM15-F-151J
C6	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C7	Mica, 27pF, ±5%, 500V	1002-0008	Elmenco	DM15-E-270J
C8	Tant, 1μF, ±20%, 50V	1011-0013	Kemet	T368A105M050AS
C9	Mica, 47pF, ±5%, 500V	1002-0012	Elmenco	DM15-E-470J
C10	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C11	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C12	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C13	Mica, 270pF, ±5%, 500V	1002-0031	Elmenco	DM15-F-271J
C14	Mica, 300pF, ±5%, 500V	1002-0059	Elmenco	DM15-301J
C15	Tant, 100μF, ±20%, 20V	1011-0010	Kemet	T368C106M050AS
C16	Mica, 30pF, ±5%, 500V	1002-0043	Elmenco	DM15-E-300J
C17	Tant, 10μF, +50-20%, 35V	1011-0006	ITT	TAG-10/35-20
C18	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C19	Tant, 10μF, +50-20%, 35V	1011-0006	ITT	TAG-10/35-20
C20	Mica, 120pF, ±5%, 500V	1002-0010	Elmenco	DM15-F-121J
C21	Tant, 100μF, ±20%, 20V	1011-0010	Kemet	T368C106M050AS
C22	Tant, 1μF, ±20%, 50V	1011-0013	Kemet	T368A105M050AS
C23	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C24	Mica, 30pF, ±5%, 500V	1002-0043	Elmenco	DM15-E-300J
C25	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C26	Tant, 10μF, +50-20%, 35V	1011-0006	ITT	TAG-10/35-20
C27	Tant, 10μF, +50-20%, 35V	1011-0006	ITT	TAG-10/35-20
C28	Tant, 1μF, ±20%, 50V	1011-0013	Kemet	T368A105M050AS
C29	Mica, 150pF, ±5%, 500V	1002-0021	Elmenco	DM15-F-151J
C30	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C31	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C32	Tant, 10μF, +50-20%, 35V	1011-0006	ITT	TAG-10/35-20
C33	Cer, 4.7pF, ±.25pF, 500V	1005-0015	Erie	301-000-C0H0-479C
C34	Tant, 100μF, ±20%, 20V	1011-0010	Kemet	T368C106M050AS
C35	Tant, 1μF, ±20%, 50V	1011-0013	Kemet	T368A105M050AS
C36	Mica, 1800pF, ±5%, 500V	1002-0073	Elmenco	DM19-F-182J
C37	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C38	Cer, 6.8pF, ±.25pF, 500V	1005-1006	Erie	301-000-C0H0-689C
C39	Poly, .0012μF, ±5%, 50V	1008-0084	IMB	PA2A122J
C40	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C41	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C42	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C43	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C44	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C45	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C46	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C47	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C48	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C49	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C50	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z

FIRST L. O. 2100 (cont.)

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
C51	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C52	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C53	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C54	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C55	Cer, .01μF, ±10%, 100V	1005-0065	Aerovox	CK06BX103K
C56	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C57	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C58	Mica, 15pF, ±5%, 500V	1002-0001	Elmenco	DM15-C-150J
C59	Mica, 100pF, ±5%, 500V	1002-0011	Elmenco	DM15-F-101J
C60	Mica, 510pF, ±5%, 500V	1002-0036	Elmenco	DM15-F-511J
C61	Mica, 1000pF, ±5%, 100V	1002-0015	Elmenco	DM15-F-102J
C62	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C63	Tant, 1μF, ±20%, 50V	1011-0013	Kemet	T368A105M050AS
C64	Tant, 10μF, +50-20%, 35V	1011-0006	ITT	TAG-10/35-20
C65	Tant, 1μF, ±20%, 50V	1011-0013	Kemet	T368A105M050AS
	DIODES			
CR1	Si, Signal, 75 PIV, 1N3064	1281-0013	Teledyne	1N3064
CR2	Hot Carrier, HPA2800	1283-0001	HPA	HPA2800
CR3	Hot Carrier, HPA2800	1283-0001	HPA	HPA2800
CR4	Hot Carrier, HPA2800	1283-0001	HPA	HPA2800
CR5	Hot Carrier, HPA2800	1283-0001	HPA	HPA2800
CR6	Si, Varicap, 20MWV, MV1650	1281-0037	Motorola	MV1650
CR7	Si, Signal, 75 PIV, 1N3064	1281-0013	Teledyne	1N3064
CR8	Si, Signal, 75 PIV, 1N3064	1281-0013	Teledyne	1N3064
CR9	Si, Signal, 75 PIV, 1N3064	1281-0013	Teledyne	1N3064
CR10	Si, Signal, 75 PIV, 1N3064	1281-0013	Teledyne	1N3064
CR11	Si, Signal, 75 PIV, 1N3064	1281-0013	Teledyne	1N3064
CR12	Si, Signal, 75 PIV, 1N3064	1281-0013	Teledyne	1N3064
CR13	Si, Varicap, 12V, 550pF, .4W	1281-0072	Motorola	MV1401
CR14	Si, Dual Varicap, 32V, 40pF	1281-0058	Motorola	MV104
	INDUCTORS			
L1	RF Choke, .82μH, ±10%, Molded	1585-0061	Delevan	1537-10
L2	RF Choke, .39μH, ±10%, Molded	1585-0062	Delevan	1537-884
L3	RF Choke, 15μH, ±10%, Molded	1585-0034	Delevan	1537-40
L4	RF Choke, .47μH, ±20%, Molded	1585-0031	Delevan	1537-06
L5	Choke, 2 1/2 T. Wideband	1586-0001	Ferroxcube	VK20010/3B
L6	Inductor, Pot Core, 1.8-2.1 μH	1596-0083	Cushman	
L7	Choke, 2 1/2T T. Wideband	1586-0001	Ferroxcube	VK20010/3B
L8	RF Choke, 3.9μH, ±10%, Molded	1585-0014	Delevan	1537-26
L9	Choke, 2 1/2 T. Wideband	1586-0001	Ferroxcube	VK20010/3B
L10	RF Choke, 1000μH, ±5%, Molded	1585-0020	Delevan	2500-28
L11	Coil, Variable, 12T	1596-7902	Cushman	
	INTEGRATED CIRCUITS			
IC1	Op. Ampl, LM301A	2025-0032	National	LM301A
IC2	Op. Ampl, LM308N	2025-0070	National	LM308N
	RESISTORS			
R1	Comp, 270Ω, ±5%, 1/4W	1066-2715	Allen-Bradley	CB2715
R2	Comp, 270Ω, ±5%, 1/4W	1066-2715	Allen-Bradley	CB2715
R3	Comp, 100Ω, ±5%, 1/4W	1066-1015	Allen-Bradley	CB1015
R4	Comp, 12k, ±5%, 1/4W	1066-1235	Allen-Bradley	CB1235
R5	Comp, 4.7k, ±5%, 1/4W	1066-4725	Allen-Bradley	CB4725

FIRST L. O. 2100 (cont.)

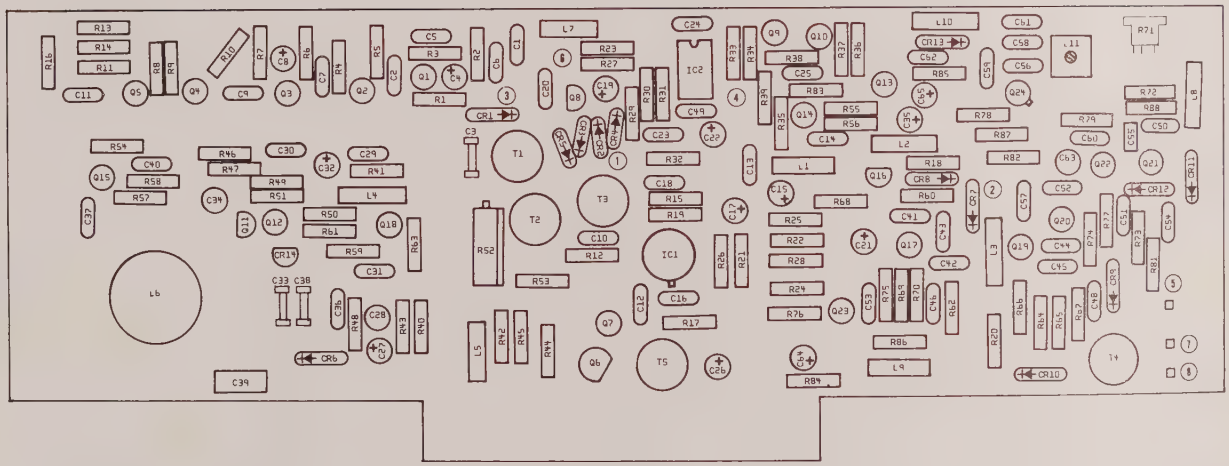
CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
R6	Comp, 47k, ±5%, 1/4W	1066-4735	Allen-Bradley	CB4735
R7	Comp, 10k, ±5%, 1/4W	1066-1035	Allen-Bradley	CB1035
R8	MF, 24.3k, ±1%, 100 PPM, 1/8W	1075-0097	Dale	MFF 1/8 T1
R9	MF, 24.3k, ±1%, 100 PPM, 1/8W	1075-0097	Dale	MFF 1/8 T1
R10	MF, 1k, ±1%, 100 PPM, 1/8W	1075-0037	Dale	MFF 1/8 T1
R11	MF, 2k, ±1%, 100 PPM, 1/8W	1075-0103	Dale	MFF 1/8 T1
R12	Comp, 100k, ±5%, 1/4W	1066-1045	Allen-Bradley	CB1045
R13	MF, 24.3k, ±1%, 100 PPM, 1/8W	1075-0097	Dale	MFF 1/8 T1
R14	MF, 24.3k, ±1%, 100 PPM, 1/8W	1075-0097	Dale	MFF 1/8 T1
R15	MF, 61.9k, ±1%, 100 PPM, 1/8W	1075-0018	Dale	MFF 1/8 T1
R16	MF, 4.75k, ±1%, 100 PPM, 1/8W	1075-0038	Dale	MFF 1/8 T1
R17	MF, 10k, ±1%, 100 PPM, 1/8W	1075-0009	Dale	MFF 1/8 T1
R18	Comp, 4.7Ω, ±5%, 1/4W	1066-0001	Allen-Bradley	CB0001
R19	MF, 47.5k, ±1%, 100 PPM, 1/8W	1075-0076	Dale	MFF 1/8 T0
R20	MF, 1 82k, ±1%, 100 PPM, 1/8W	1075-0065	Dale	MFF 1/8 T1
R21	MF, 20k, ±1%, 100 PPM, 1/8W	1075-0096	Dale	MFF 1/8 T1
R22	MF, 4.99k, ±1%, 100 PPM, 1/8W	1075-0095	Dale	MFF 1/8 T1
R23	Comp, 15k, ±5%, 1/4W	1066-1535	Allen-Bradley	CB1535
R24	MF, 20k, ±1%, 100 PPM, 1/8W	1075-0096	Dale	MFF 1/8 T1
R25	MF, 20k, ±1%, 100 PPM, 1/8W	1075-0096	Dale	MFF 1/8 T1
R26	MF, 100Ω, ±1%, 150 PPM, 1/10W	1074-1033	Dale	MF 1/10 T9
R27	Comp, 10k, ±5%, 1/4W	1066-1035	Allen-Bradley	CB1035
R28	MF, 20k, ±1%, 100 PPM, 1/8W	1075-0096	Dale	MFF 1/8 T1
R29	MF, 51.1k, ±1%, 100 PPM, 1/8W	1075-0099	Dale	MFF 1/8 T1
R30	Comp, 620Ω, ±5%, 1/4W	1066-6215	Allen-Bradley	CB6215
R31	Comp, 62k, ±5%, 1/4W	1066-6235	Allen-Bradley	CB6235
R32	MF, 51.1k, ±1%, 100 PPM, 1/8W	1075-0099	Dale	MFF 1/8 T1
R33	Comp, 18k, ±5%, 1/4W	1066-1835	Allen-Bradley	CB1835
R34	Comp, 18k, ±5%, 1/4W	1066-1835	Allen-Bradley	CB1835
R35	Comp, 1.3k, ±5%, 1/4W	1066-1325	Allen-Bradley	CB1325
R36	Comp, 5.1k, ±5%, 1/4W	1066-5125	Allen-Bradley	CB5125
R37	Comp, 200k, ±5%, 1/4W	1066-2045	Allen-Bradley	CB2045
R38	Comp, 130k, ±5%, 1/4W	1066-1345	Allen-Bradley	CB1345
R39	Comp, 62k, ±5%, 1/4W	1066-6235	Allen-Bradley	CB6235
R40	MF, 511Ω, ±1%, 150 PPM, 1/10W	1074-1008	Dale	MF 1/10 T9
R41	MF, 100Ω, ±1%, 150 PPM, 1/10W	1074-0033	Dale	MFF 1/10 T9
R42	MF, 6.19k, ±1%, 100 PPM, 1/8W	1075-0109	Dale	MFF 1/8
R43	MF, 100k, ±1%, 100 PPM, 1/8W	1075-0105	Dale	MFF 1/8 T1
R44	MF, 24.3k, ±1%, 100 PPM, 1/8W	1075-0097	Dale	MFF 1/8 T1
R45	MF, 18.2k, ±1%, 100 PPM, 1/8W	1075-0075	Dale	MFF 1/8 T0
R46	MF, 24.3k, ±1%, 100 PPM, 1/8W	1075-0097	Dale	MFF 1/8 T1
R47	MF, 4.75k, ±1%, 100 PPM, 1/8W	1075-0038	Dale	MFF 1/8 T1
R48	MF, 100k, ±1%, 100 PPM, 1/8W	1075-0105	Dale	MFF 1/8 T1
R49	MF, 24.3k, ±1%, 100 PPM, 1/8W	1075-0097	Dale	MFF 1/8 T1
R50	MF, 1/82k, ±1%, 100 PPM, 1/8W	1075-0065	Dale	MFF 1/8 T1
R51	MF, ±1%, 100 PPM, 1/8W	1075-0037	Dale	MFF 1/8 T1
R52	Pot, 10k, ±10%, 3/4W	1215-0014	Helitrim	89WR
R53	Comp, 100k, ±5%, 1/4W	1066-1045	Allen-Bradley	CB1045
R54	MF, 10k, ±1%, 100 PPM, 1/8W	1075-0009	Dale	MFF 1/8 T1
R55	Comp, 91k, ±5%, 1/4W	1066-9135	Allen-Bradley	CB9135
R56	Comp, FSV, ±5%, 1/4W	1066-XXXX	Allen-Bradley	CBXXXX
R57	MF, 1MΩ, ±1%, 150 PPM, 1/10W	1074-1039	Dale	MF 1/10 T9
R58	MF, 2k, ±1%, 100 PPM, 1/8W	1075-0103	Dale	MFF 1/8 T1
R59	MF, 100k, ±1%, 100 PPM, 1/8W	1075-0105	Dale	MFF 1/8 T1
R60	MF, 100Ω, ±1%, 150 PPM, 1/10W	1074-1033	Dale	MF 1/10 T9

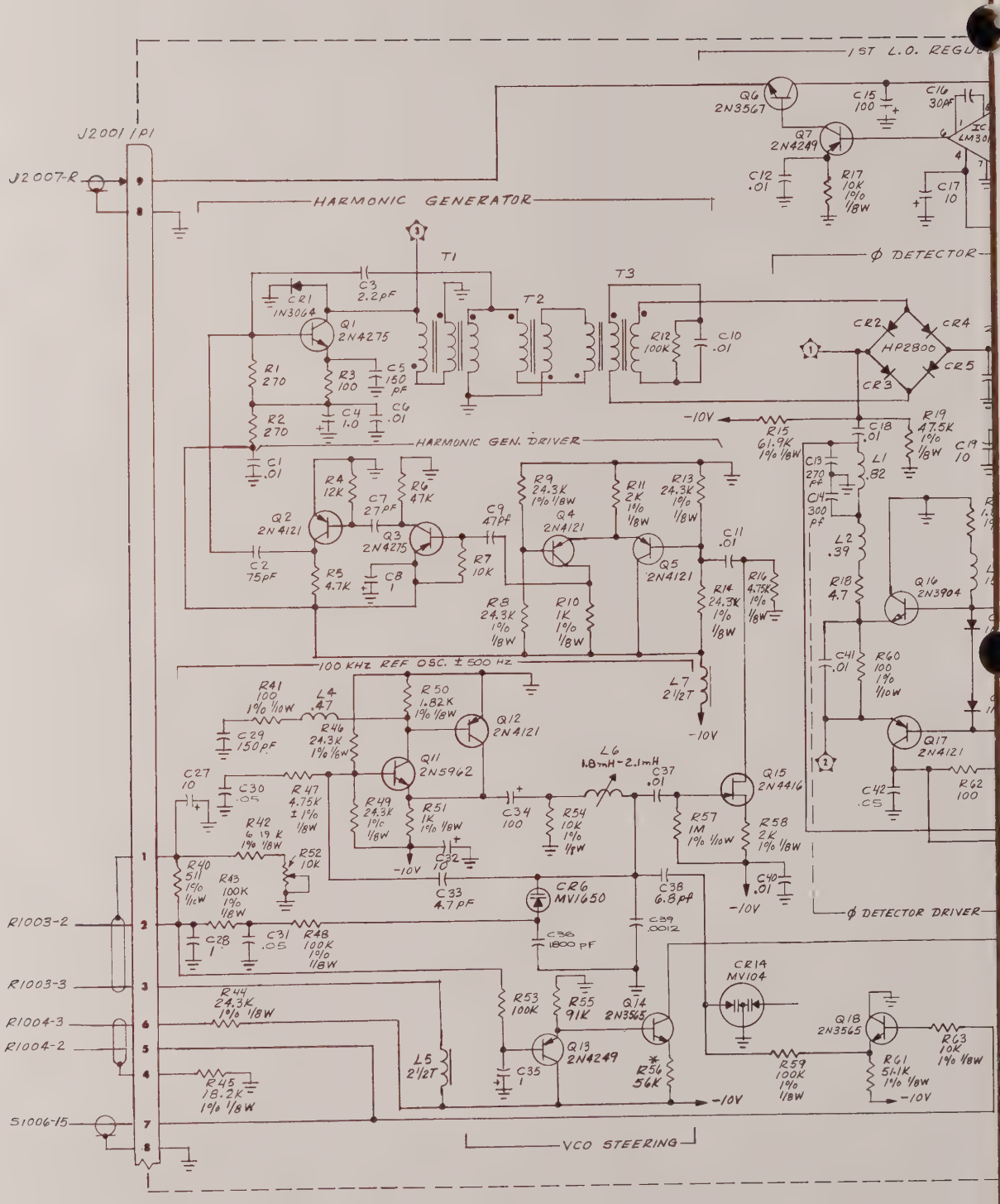
FIRST L. O. 2100 (cont.)

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
R61	MF, 51.1k, ±1%, 100 PPM, 1/8W	1075-0099	Dale	MFF 1/8 T1
R62	Comp, 100Ω, ±5%, 1/4W	1066-1015	Allen-Bradley	CB1045
R63	MF, 10k, ±1%, 100 PPM, 1/8W	1075-0009	Dale	MFF 1/8 T1
R64	MF, 8.25k, ±1%, 100 PPM, 1/8W	1075-0014	Dale	MFF 1/8 T1
R65	MF, 1k, ±1%, 100 PPM, 1/8W	1075-0037	Dale	MFF 1/8 T1
R66	MF, 475Ω, ±1%, 100 PPM, 1/8W	1075-0023	Dale	MFF 1/8 T1
R67	Comp, 470Ω, ±5%, 1/4W	1066-4715	Allen-Bradley	CB4715
R68	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R69	Comp, 3.9k, ±5%, 1/4W	1066-3925	Allen-Bradley	CB3925
R70	Comp, 16k, ±5%, 1/4W	1066-1635	Allen-Bradley	CB1035
R71	Pot, 100Ω, ±20%, 1/2W	1203-0092	Beckman	91X-R100
R72	Comp, 3k, ±5%, 1/4W	1066-3025	Allen-Bradley	CB3025
R73	Comp, 8.2k, ±5%, 1/4W	1066-8225	Allen-Bradley	CB8225
R74	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R75	Comp, 620Ω, ±5%, 1/4W	1066-6215	Allen-Bradley	CB6215
R76	Comp, 200Ω, ±5%, 1/4W	1066-2015	Allen-Bradley	CB2015
R77	Comp, 100Ω, ±5%, 1/4W	1066-1015	Allen-Bradley	CB1015
R78	MF, 237Ω, ±1%, 150 PPM, 1/10W	1074-1041	Dale	MF 1/10 T9
R79	Comp, 4.7Ω, ±5%, 1/4W	1066-0001	Allen-Bradley	CB0001
R80	MF, 200Ω, ±1%, 100 PPM, 1/8W	1075-0082	Dale	MFF 1/8 T1
R81	Comp, 51Ω, ±5%, 1/4W	1066-5105	Allen-Bradley	CB5105
R82	MF, 3.01k, ±1%, 100 PPM, 1/8W	1075-0127	Dale	MFF 1/8 T1
R83	Comp, 100Ω, ±5%, 1/4W	1066-1015	Allen-Bradley	CB1015
R84	MF, FSV, ±1%, 100 PPM, 1/8W	1075-xxxx	Dale	MFF 1/8 T1
R85	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R86	MF, FSV, ±1%, 100 PPM, 1/8W	1075-xxxx	Dale	MFF 1/8 T1
R87	MF, 12.1k, ±1%, 100 PPM, 1/8W	1075-0011	Dale	MFF 1/8 T1
R88	Comp, 300Ω, ±5%, 1/4W	1066-3015	Allen-Bradley	CB3015
	TRANSFORMERS			
T1	Toroid, Trifilar	1579-0017	Cushman	
T2	Toroid, Trifilar	1579-0017	Cushman	
T3	Toroid, Trifilar	1579-0017	Cushman	
T4	Toroid, Trifilar	1579-0017	Cushman	
T5	Toroid, Trifilar	1579-0017	Cushman	
	TRANSISTORS			
Q1	Si, NPN, 2N4275	1272-0016	Fairchild	2N4275
Q2	Si, PNP, 2N4121	1272-0023	Fairchild	2N4121
Q3	Si, NPN, 2N4275	1272-0016	Fairchild	2N4275
Q4	Si, PNP, 2N4121	1272-0023	Fairchild	2N4121
Q5	Si, PNP, 2N4121	1272-0023	Fairchild	2N4121
Q6	Si, NPN, 2N3567	1272-0014	Fairchild	2N3567
Q7	Si, PNP, 2N4249	1272-0024	Fairchild	2N4249
Q8	Si, NPN, 2N5962	1272-0059	Fairchild	2N5962
Q9	Si, PNP, 2N4249	1272-0024	Fairchild	2N4249
Q10	Si, PNP, 2N4249	1272-0024	Fairchild	2N4249
Q11	Si, NPN, 2N5962	1272-0059	Fairchild	2N5962
Q12	Si, PNP, 2N4121	1272-0023	Fairchild	2N4121
Q13	Si, PNP, 2N4249	1272-0024	Fairchild	2N4249
Q14	Si, NPN, 2N3565	1272-0017	Fairchild	2N3565
Q15	J-FET, N-Channel, 2N4416	1272-0048	Teledyne	2N4416
Q16	Si, NPN, 2N3904	1272-0032	Motorola	2N3904
Q17	Si, PNP, 2N4121	1272-0023	Fairchild	2N4121
Q18	Si, NPN, 2N3565	1272-0017	Fairchild	2N3565
Q19	Si, NPN, 2N3563	1272-0022	Fairchild	2N3563
Q20	Si, NPN, 2N3563	1272-0022	Fairchild	2N3563

FIRST L. O. 2100 (cont.)

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
Q21	Si, NPN, 2N4275	1272-0016	Fairchild	2N4275
Q22	Si, PNP, 2N4121	1272-0023	Fairchild	2N4121
Q23	Si, NPN, 2N3563	1272-0022	Fairchild	2N3563
Q24	Si, NPN, 2N5179	1272-0060	Motorola	2N5179





NOTE:

1. RESISTORS – 1/4W, 5% VALUES IN OHMS UNLESS OTHERWISE NOTED.
2. CAPACITORS – VALUES IN μF UNLESS OTHERWISE NOTED.
3. INDUCTORS – VALUES IN μH UNLESS OTHERWISE NOTED.
4. *FACTORY SELECT. TYPICAL VALUE SHOWN.
5. ALL VOLTAGES ARE DC UNLESS OTHERWISE NOTED.

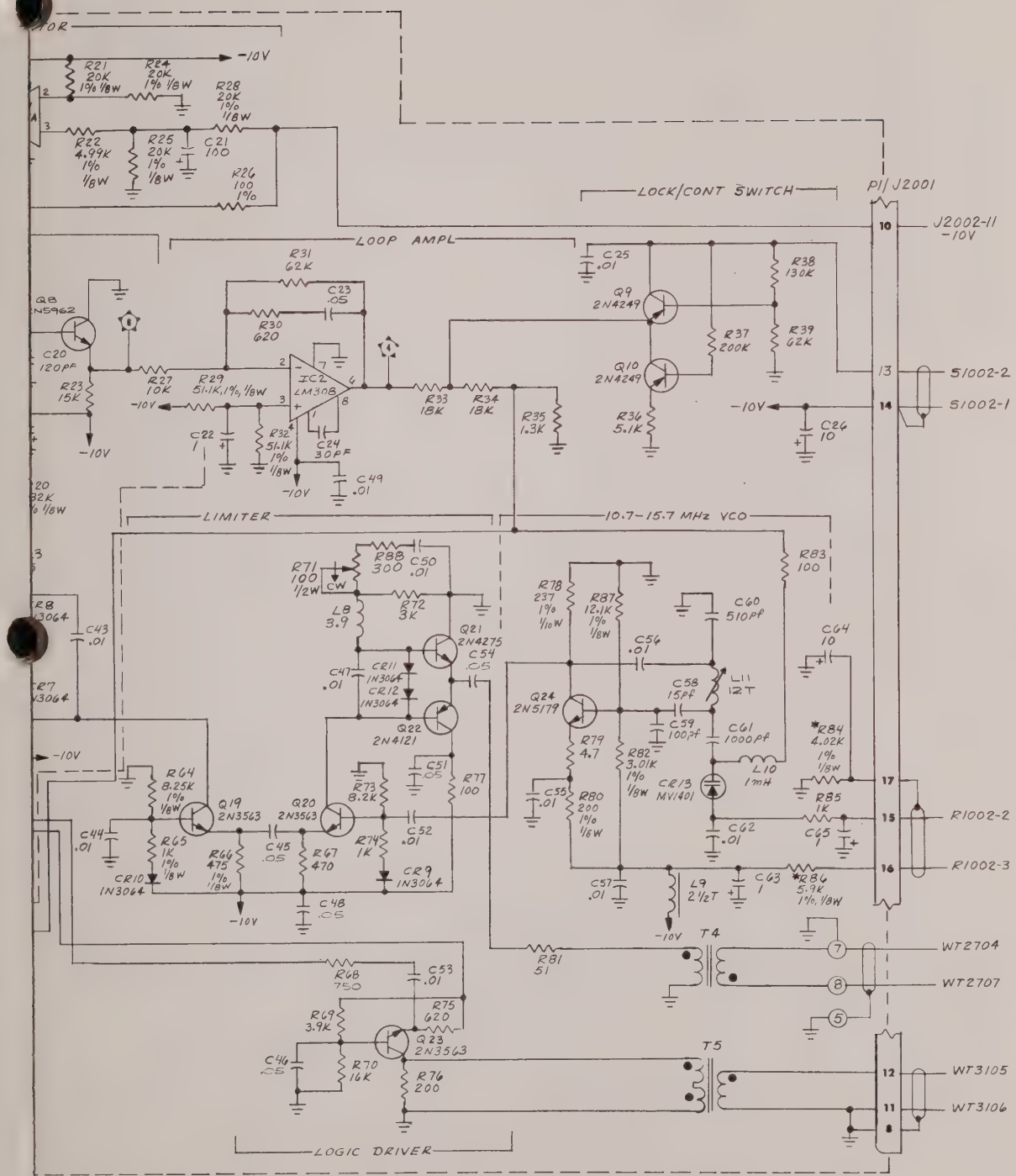


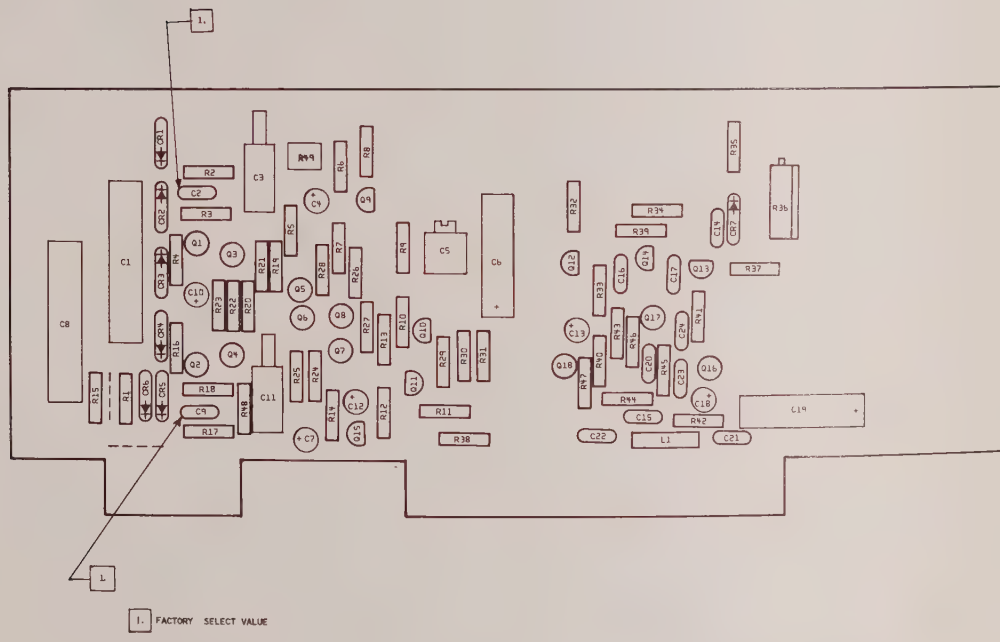
Figure 3-4. First L.O. 2100

R. F. AMPLIFIER. 2200

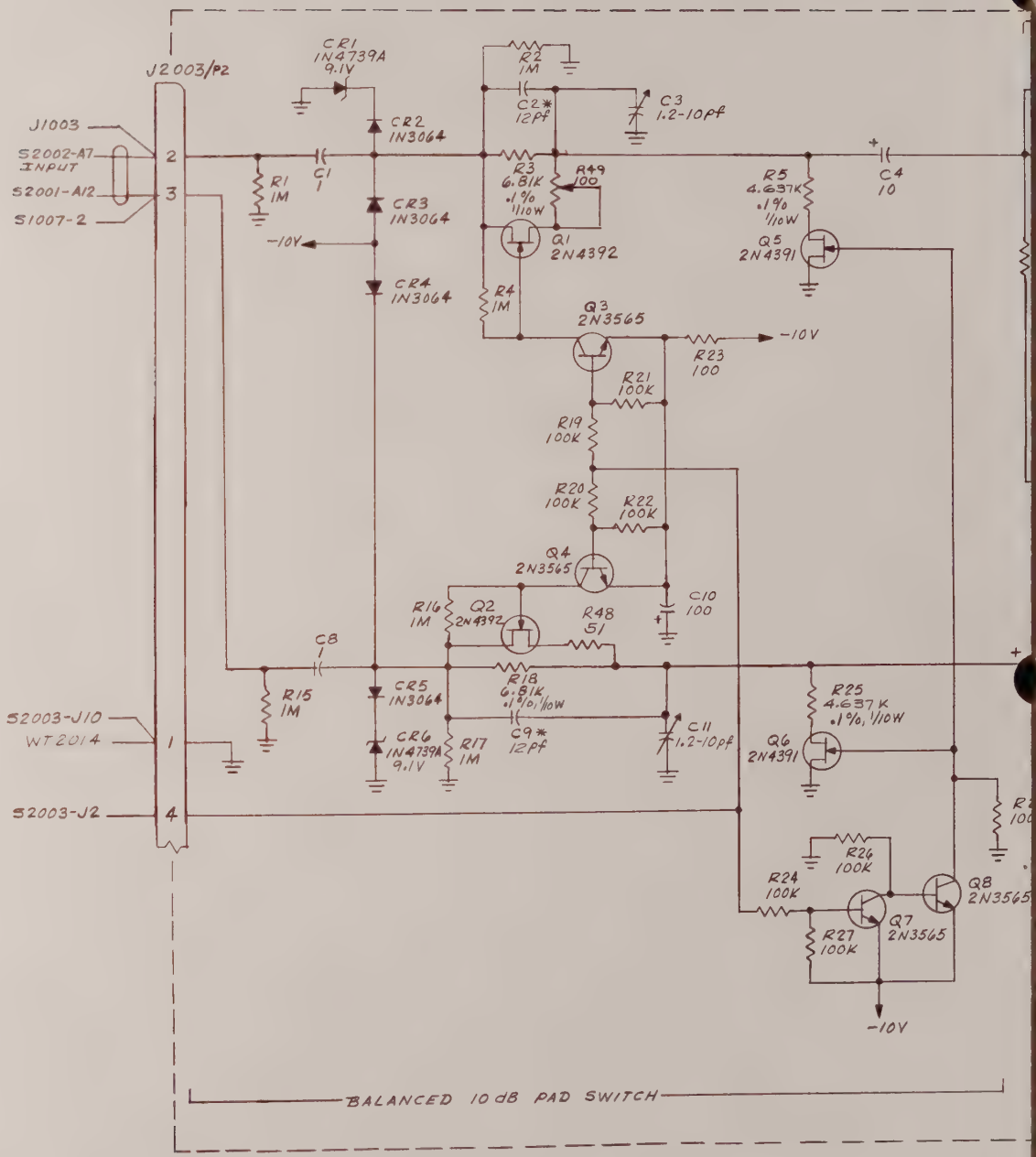
CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
2200	RF Amplifier Assembly	7001-0247	Cushman	
	P. C. Board	1780-0475	Cushman	
	CAPACITORS			
C1	Met. Mylar, 1μF, ±20%, 400V	1008-0072	Electrocube	230B1E105M
C2	Mica, FSV, ±5%, 500V	1002-XXXX	Elmenco	
C3	Trim, 1.2-10pF, -0, +50%, 250V	1001-0013	R-Triko	122095
C4	Elect, 10μF, ±20%, 35 V	1013-0044	Nichicon	35UKB10M
C5	Trim, 2-8pF, 350V	1001-0010	Erie	538-006A
C6	Elec, 100μF, +75-10%, 12V	1013-0011	Sprague	30D107G012CC5
C7	Tant, 10μF, +50-20%, 35V	1011-0006	ITT	TAG-10/35-20
C8	Met. Mylar, 1μF, ±20%, 400V	1008-0072	Electrocube	230B1E105M
C9	Mica, FSV, ±5%, 500V	1002-XXXX	Elmenco	
C10	Tant, 100μF, ±20%, 20V	1011-0011	Kemet	T368C106M050AS
C11	Trim, 1.2-10pF, -0, +50%, 250V	1001-0013	R-Triko	122095
C12	Elect, 10μF, ±20%, 35 V	1013-0044	Nichicon	35UKB10M
C13	Tant, 10μF, +50-20%, 35V	1011-0006	ITT	TAG-10/35-20
C14	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C15	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C16	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C17	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C18	Tant, 10μF, 50-20%, 35V	1011-0006	ITT	TAG-10/35-20
C19	Elec, 100μF, +75-10%, 12V	1013-0011	Sprague	30D107G012CC5
C20	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C21	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C22	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C23	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C24	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
	DIODES			
CR1	Si, Zener, 9.1V, ±5%, 1W, 1N4739A	1281-0027	IRC	1N4739A
CR2	Si, Signal, 75 PIV, 1N3064	1281-0013	Teledyne	1N3064
CR3	Si, Signal, 75 PIV, 1N3064	1281-0013	Teledyne	1N3064
CR4	Si, Signal, 75 PIV, 1N3064	1281-0013	Teledyne	1N3064
CR5	Si, Signal, 75 PIV, 1N3064	1281-0013	Teledyne	1N3064
CR6	Si, Zener, 9.1V, ±5%, 1N4739A	1281-0027	IRC	1N4739A
CR7	Si, Signal, 75 PIV, 1N3064	1281-0013	Teledyne	1N3064
	INDUCTOR			
L1	RF Choke, 1000μH, ±5%	1585-0020	Delevan	2500-28
	RESISTORS			
R1	Comp, 1MΩ, ±5%, 1/4W	1066-1055	Allen-Bradley	CB1055
R2	Comp, 1MΩ, ±5%, 1/4W	1066-1055	Allen-Bradley	CB1055
R3	MF, 6.81k, ±.1%, 25 PPM, 1/10W	1074-0057	Dale	MF 1/10 T9
R4	Comp, 1MΩ, ±5%, 1/4W	1066-1055	Allen-Bradley	CB1055
R5	MF, 4.637k, ±.1%, 25 PPM, 1/10W	1074-1053	Dale	MF 1/10 T9
R6	MF, 20k, ±1%, 100 PPM, 1/8W	1075-0096	Dale	MFF 1/8 T1
R7	MF, 20k, ±1%, 100 PPM, 1/8W	1075-0096	Dale	MFF 1/8 T1
R8	Comp, 510Ω, ±5%, 1/4W	1066-5115	Allen-Bradley	CB5115
R9	MF, 249Ω, ±1%, 100 PPM, 1/10W	1074-0098	Dale	MF 1/10 T1
R10	MF, 249Ω, ±1%, 100 PPM, 1/10W	1074-0098	Dale	MF 1/10 T1

R. F. AMPLIFIER. 2200

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
R11	MF, 511Ω, ±1%, 150 PPM, 1/10W	1074-1008	Dale	RN55D5110-F
R12	MF, 20k, ±1%, 100 PPM, 1/8W	1075-0096	Dale	MFF 1/8 T1
R13	MF, 20k, ±1%, 100 PPM, 1/8W	1075-0096	Dale	MFF 1/8 T1
R14	Comp, 2k, ±5%, 1/4W	1066-2025	Allen-Bradley	CB2025
R15	Comp, 1MΩ, ±5%, 1/4W	1066-1055	Allen-Bradley	CB1055
R16	Comp, 1MΩ, ±5%, 1/4W	1066-1055	Allen-Bradley	CB1055
R17	Comp, 1MΩ, ±5%, 1/4W	1066-1055	Allen-Bradley	CB1055
R18	MF, 6.8k, ±.1%, 25 PPM, 1/10W	1074-0057	Dale	MF 1/10 T9
R19	Comp, 100k, ±5%, 1/4W	1066-1045	Allen-Bradley	CB1045
R20	Comp, 100k, ±5%, 1/4W	1066-1045	Allen-Bradley	CB1045
R21	Comp, 100k, ±5%, 1/4W	1066-1045	Allen-Bradley	CB1045
R22	Comp, 100k, ±5%, 1/4W	1066-1045	Allen-Bradley	CB1045
R23	Comp, 100Ω, ±5%, 1/4W	1066-1015	Allen-Bradley	CB1015
R24	Comp, 100k, ±5%, 1/4W	1066-1045	Allen-Bradley	CB1045
R25	MF, 4.637k, ±.1%, 25 PPM, 1/10W	1074-1053	Dale	MF 1/10 T9
R26	Comp, 100k, ±5%, 1/4W	1066-1045	Allen-Bradley	CB1045
R27	Comp, 100k, ±5%, 1/4W	1066-1045	Allen-Bradley	CB1045
R28	Comp, 100k, ±5%, 1/4W	1066-1045	Allen-Bradley	CB1045
R29	MF, 200Ω, ±1%, 100 PPM, 1/8W	1075-0082	Dale	MFF 1/8 T1
R30	Comp, 680Ω, ±5%, 1/4W	1066-6815	Allen-Bradley	CB6815
R31	Comp, 2.7k, ±5%, 1/4W	1066-2725	Allen-Bradley	CB2725
R32	MF, 40.2Ω, ±1%, 100 PPM, 1/8W	1075-0124	Dale	MFF 1/8 T1
R33	MF, 3.4k, ±1%, 100 PPM, 1/8W	1075-0020	Dale	MFF 1/8 T1
R34	MF, 4.32k, ±1%, 100 PPM, 1/8W	1075-0111	Dale	MFF 1/8 RN55D432TF
R35	MF, 3.09k, ±1%, 100 PPM, 1/8W	1075-0091	Dale	MFF 1/8 T1
R36	Pot, 1k, ±10%, 3/4W	1215-0013	Helitrim	89WR
R37	MF, 2k, ±1%, 100 PPM, 1/8W	1075-0103	Dale	MFF 1/8 T1
R38	MF, 10k, ±1%, 100 PPM, 1/8W	1075-0009	Dale	MFF 1/8 T1
R39	Comp, 2k, ±5%, 1/4W	1066-2025	Allen-Bradley	CB2025
R40	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R41	Comp, 2k, ±5%, 1/4W	1066-2025	Allen-Bradley	CB2025
R42	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R43	Comp, 2k, ±5%, 1/4W	1066-2025	Allen-Bradley	CB2025
R44	Comp, 30k, ±5%, 1/4W	1066-3035	Allen-Bradley	CB3035
R45	Comp, 39k, ±5%, 1/4W	1066-3935	Allen-Bradley	CB3935
R46	Comp, 30k, ±5%, 1/4W	1066-3035	Allen-Bradley	CB3035
R47	Comp, 10k, ±5%, 1/4W	1066-1035	Allen-Bradley	CB1035
R48	Comp, 51Ω, ±5%, 1/4W	1066-5105	Allen-Bradley	CB5105
R49	Pot, 100Ω, ±20%, 1/2W	1203-0092	Beckman	91X-R100
	TRANSISTORS			
Q1	Xstr, J-FET, N-Chan, 2N4392	1272-0054	Teledyne	2N4392
Q2	Xstr, J-FET, N-Chan, 2N4392	1272-0054	Teledyne	2N4392
Q3	Si, NPN, 2N3565	1272-0017	Fairchild	2N3565
Q4	Si, NPN, 2N3565	1272-0017	Fairchild	2N3565
Q5	J-FET, N-Chan, 2N4391	1272-0042	Teledyne	2N4391
Q6	J-FET, N-Chan, 2N4391	1272-0042	Teledyne	2N4391
Q7	Si, NPN, 2N3565	1272-0017	Fairchild	2N3565
Q8	Si, NPN, 2N3565	1272-0017	Fairchild	2N3565
Q9	Si, NPN, 2N5962	1272-0059	Fairchild	2N5962
Q10	Si, NPN, MPS-H37	1272-0073	Motorola	MPS-H37
Q11	Si, NPN, 2N5962	1272-0059	Fairchild	2N5962
Q12	Si, NPN, 2N5962	1272-0059	Fairchild	2N5962
Q13	Si, NPN, 2N5962	1272-0059	Fairchild	2N5962
Q14	Si, NPN, 2N5962	1272-0059	Fairchild	2N5962
Q15	Si, NPN, 2N5962	1272-0059	Fairchild	2N5962
Q16	Si, NPN, 2N3565	1272-0017	Fairchild	2N3565
Q17	Si, PNP, 2N4249	1272-0024	Fairchild	2N4249
Q18	Si, NPN, 2N4275	1272-0016	Fairchild	2N4275



1. FACTORY SELECT VALUE



NOTE:

1. RESISTORS - 1/4W, 5% VALUES IN OHMS UNLESS OTHERWISE NOTED.
2. CAPACITORS - VALUES IN μF UNLESS OTHERWISE NOTED.
3. INDUCTORS - VALUES IN μH UNLESS OTHERWISE NOTED.
4. *FACTORY SELECT. TYPICAL VALUE SHOWN.
5. ALL VOLTAGES ARE DC UNLESS OTHERWISE NOTED.
6. ALL 100/20 CAPACITORS LAYOUT COMPATIBLE TO 100/12 ALUM CAPS.
7. IN P.C. BOARD 1780 - 0475 REV. A & B, Q18 WILL BE NPN TRANSISTOR 2N3565 OR 2N5089.
   IN P.C. BOARD 1780 - 0475 REV. C & UP, Q18 WILL BE NPN TRANSISTOR 2N4275.

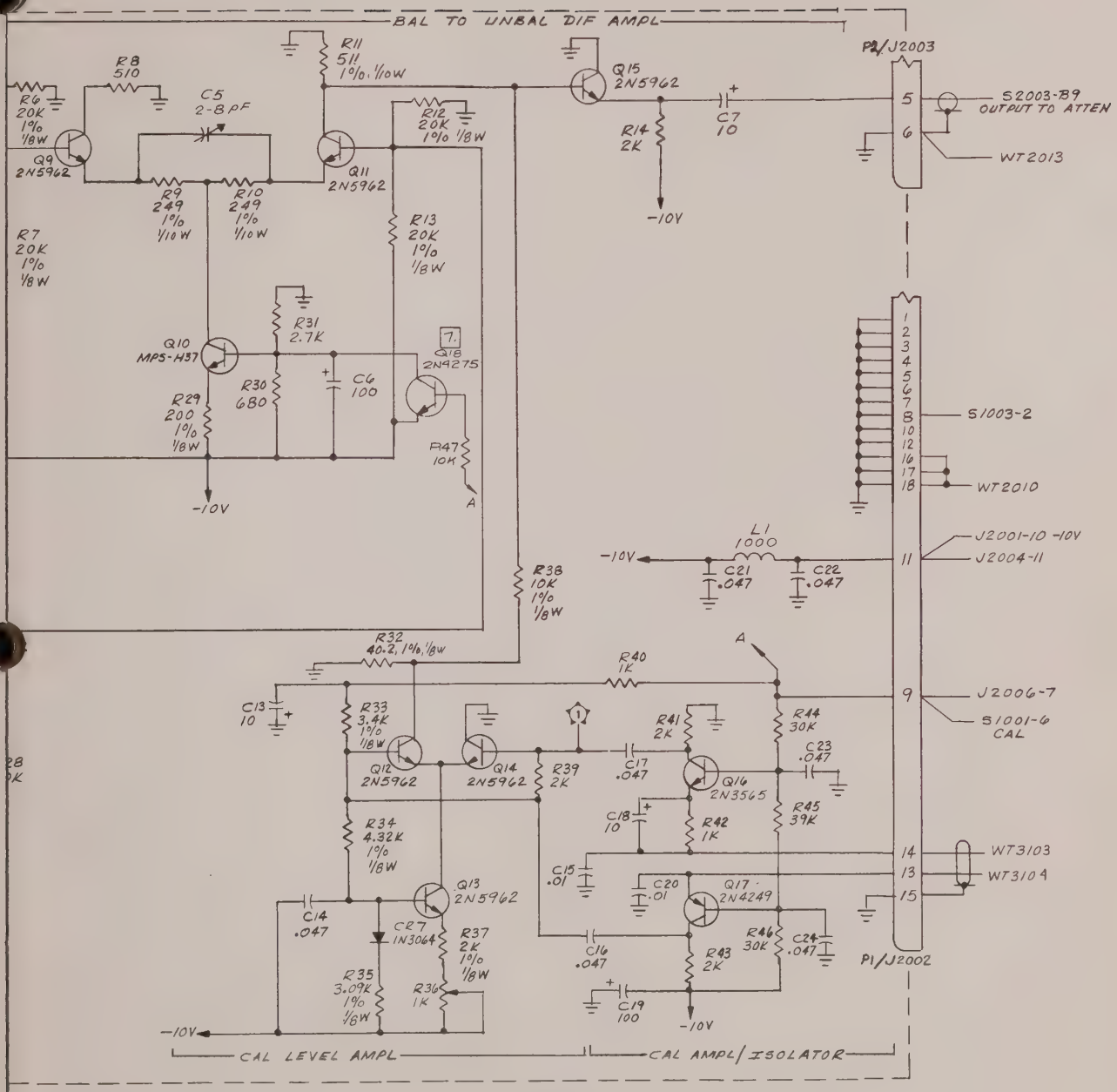


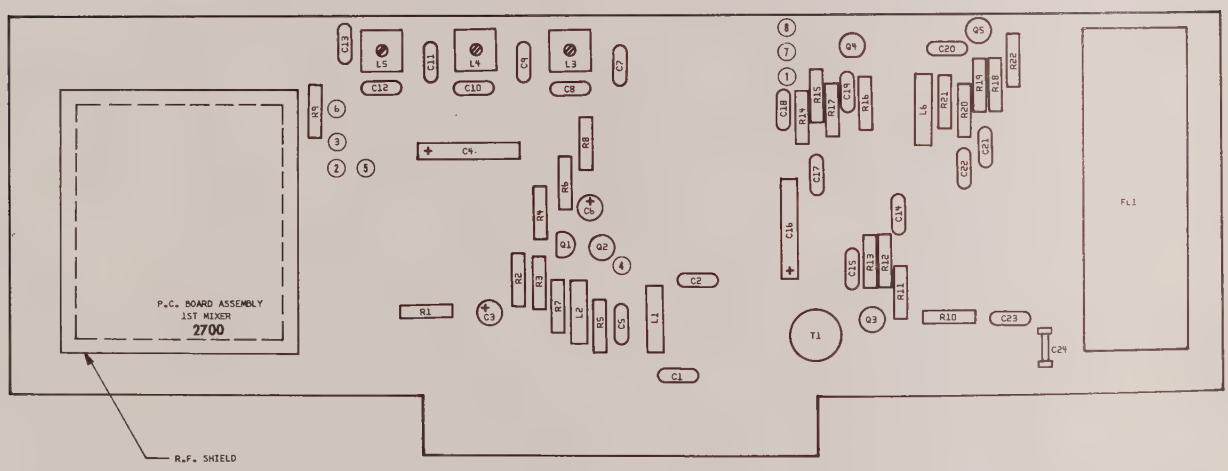
Figure 3-5. R.F. Amplifier. 2200

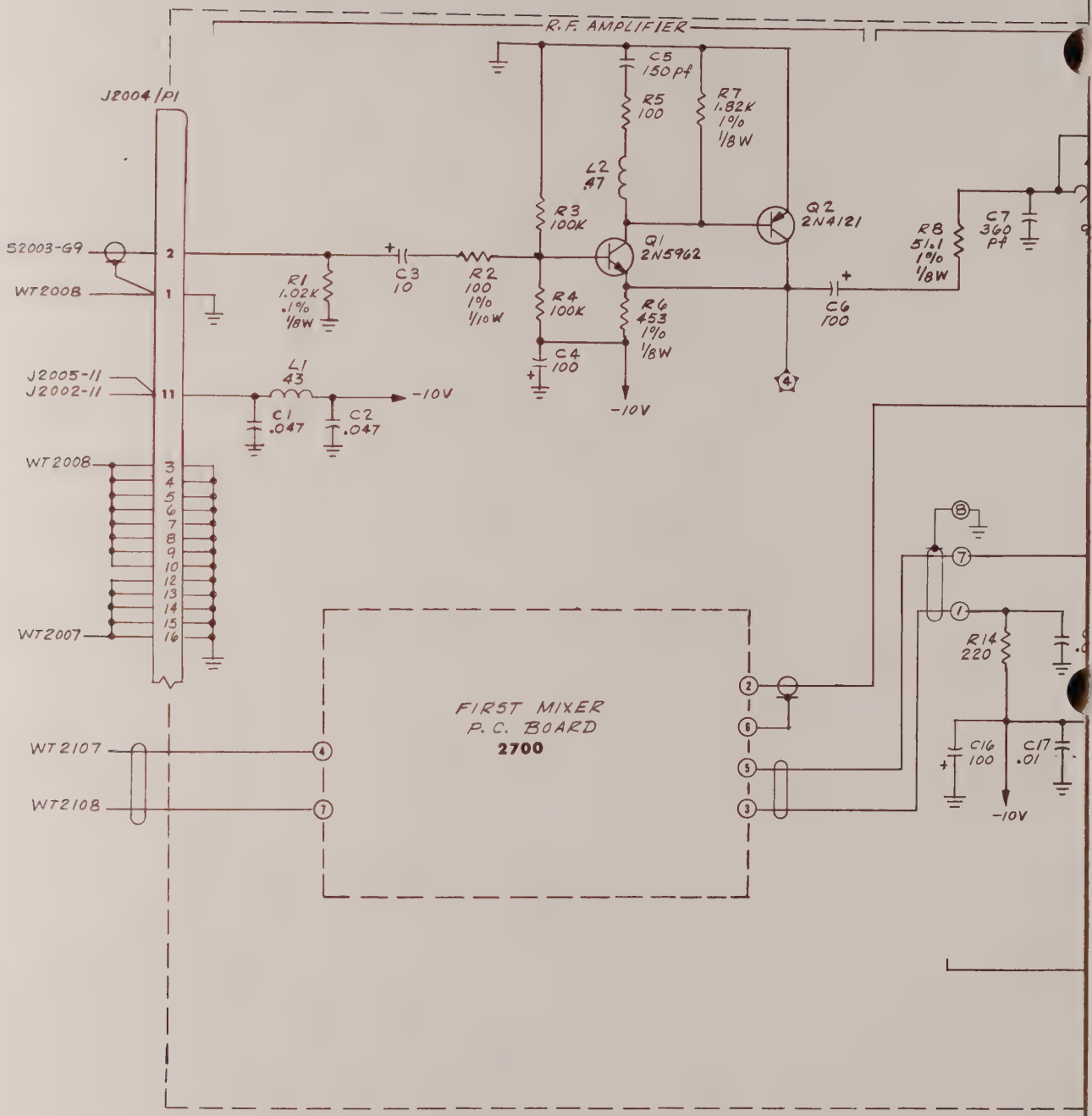
FIRST I. F. AMPLIFIER. 2300

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
2300	1st I. F. Amplifier Assembly	7001-0248	Cushman	
	P.C. Board	1780-0476	Cushman	
	CAPACITORS			
C1	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C2	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C3	Tant, 10μF, +50-20%, 35V	1011-0006	ITT	TAG-10/35-20
C4	Elec, 100μF, +75-10%, 12V	1013-0011	Sprague	30D107G012CC5
C5	Mica, 150pF, ±5%, 500V	1002-0021	Elmenco	DM15-F-151J
C6	Tant, 100μF, ±20%, 20V	1011-0010	Kemet	T362D107M020AS
C7	Mica, 360pF, ±5%, 500V	1002-0040	Elmenco	DM15-F-361J
C8	Mica, 27pF, ±5%, 500V	1002-0008	Elmenco	DM15-E-270J
C9	Mica, 910pF, ±5%, 500V	1002-0062	Elmenco	DM-5-F-911J
C10	Mica, 110pF, ±5%, 500V	1002-0026	Elmenco	DM-5-F-111J
C11	Mica, 820pF, ±5%, 300V	1002-0039	Elmenco	DM15-F-821J
C12	Mica, 91pF, ±5%, 500V	1002-0027	Elmenco	DM15-F-910J
C13	Mica, 300pF, ±5%, 500V	1002-0059	Elmenco	DM15-F-301J
C14	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C15	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C16	Elec, 100μF, +75-10%, 12V	1013-0011	Sprague	30D107G012CC5
C17	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C18	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C19	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5935-512-Y5U-103Z
C20	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C21	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C22	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C23	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C24	Cer, 3.3pF, ±.25pF, 500V	1005-0011	Erie	301-000-C0J0-339C
	FILTER			
FL1	Crystal, 10.7 MHz (3dB BW=2.3kHz)	1040-0031	Cushman	
	INDUCTORS			
L1	RF Choke, 43μH, ±5%	1585-0060	Delevan	1537-58
L2	RF Choke, .47μH, ±20%	1585-0031	Delevan	1537-06
L3	Coil, Variable	1596-0078	Cushman	
L4	Coil, Variable	1596-0078	Cushman	
L5	Coil, Variable	1596-0078	Cushman	
L6	RF Choke, 68μH, ±5%	1585-0059	Delevan	1537-68
	RESISTORS			
R1	MF, 1.02k, .1%, 25 PPM, 1/8W	1075-0126	Dale	MFF T8 T9
R2	MF, 100Ω, ±1%, 150 PPM, 1/10W	1074-1033	Dale	RN55D1000F
R3	Comp, 100k, ±5%, 1/4W	1066-1045	Allen-Bradley	CB1045
R4	Comp, 100k, ±5%, 1/4W	1066-1045	Allen-Bradley	CB1045
R5	Comp, 100Ω, ±5%, 1/4W	1066-1015	Allen-Bradley	CB1015
R6	MF, 453Ω, ±1%, 100 PPM, 1/8W	1075-0107	Dale	MFF 1/8 T1
R7	MF, 1.82k, ±1%, 100 PPM 1/8W	1075-0065	Dale	MFF 1/8 T1
R8	MF, 51.1Ω, ±1%, 150 PPM, 1/8W	1075-0077	Dale	MFF 1/8 T0
R9	MF, 200Ω, ±1%, 100 PPM, 1/8W	1075-0082	Dale	MFF 1/8 T1
R10	MF, 432Ω, ±1%, 100 PPM, 1/8W	1075-0142	Dale	RN55D

FIRST I. F. AMPLIFIER. 2300 (cont.)

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
R11	Comp, 2k, ±5%, 1/4W	1066-2025	Allen-Bradley	CB2025
R12	Comp, 5.6k, ±5%, 1/4W	1066-5625	Allen-Bradley	CB5625
R13	Comp, 15k, ±5%, 1/4W	1066-1535	Allen-Bradley	CB1535
R14	Comp, 220Ω, ±5%, 1/4W	1066-2215	Allen-Bradley	CB2215
R15	Comp, 1.8k, ±5%, 1/4W	1066-1825	Allen-Bradley	CB1825
R16	MF, 1.00k, ±1%, 100 PPM, 1/8W	1075-0037	Dale	MFF 1/8 T1
R17	Comp, 8.2k, ±5%, 1/4W	1066-8225	Allen-Bradley	CB8225
R18	Comp, 3.3k, ±5%, 1/4W	1066-3325	Allen-Bradley	CB3325
R19	Comp, 6.8k, ±5%, 1/4W	1066-6825	Allen-Bradley	CB6825
R20	Comp, 2.4k, ±5%, 1/4W	1066-2425	Allen-Bradley	CB2425
R21	MF, 412Ω, ±1%, 100 PPM, 1/8	1075-0084	Dale	MFF 1/8 T1
R22	MF, 453Ω, ±1%, 100 PPM, 1/10W	1075-0107	Dale	MFF 1/8 T1
	TRANSFORMER			
T1	Toroid	1579-0036	Cushman	
	TRANSISTORS			
Q1	Si, NPN, 2N5962	1272-0059	Fairchild	2N5962
Q2	Si, PNP, 2N4121	1272-0023	Fairchild	2N4121
Q3	Si, NPN, 2N3563	1272-0022	Fairchild	2N3563
Q4	Si, NPN, 2N3904	1272-0032	Motorola	2N3904
Q5	Si, NPN, 2N3563	1272-0022	Fairchild	2N3563


P.C. BOARD ASSEMBLY
1ST MIXER
2700
R.F. SHIELD
C13
L5
C12
C11
L4
C10
C9
L3
C8
C7
R9
C4
R8
R6
R4
Q1
Q2
R2
R3
R7
L2
R5
C5
L1
C2
C3
R1
C1
T1
Q3
R11
R12
R13
C15
C16
C17
C18
R14
R15
R17
C19
R16
C14
Q4
C20
Q5
L6
R21
R20
R19
R18
R22
C21
C22
C23
C24
FL1



NOTE:

1. RESISTORS - 1/4W, 5% VALUES IN OHMS UNLESS OTHERWISE NOTED.
2. CAPACITORS - VALUES IN μF UNLESS OTHERWISE NOTED.
3. INDUCTORS - VALUES IN μH UNLESS OTHERWISE NOTED.
4. *FACTORY SELECT. TYPICAL VALUE SHOWN.
5. ALL VOLTAGES ARE DC UNLESS OTHERWISE NOTED.
6. ALL 100/20 CAPACITATORS LAYOUT COMPATIBLE TO 100/12 ALUM CAPS, EXCEPT C6.

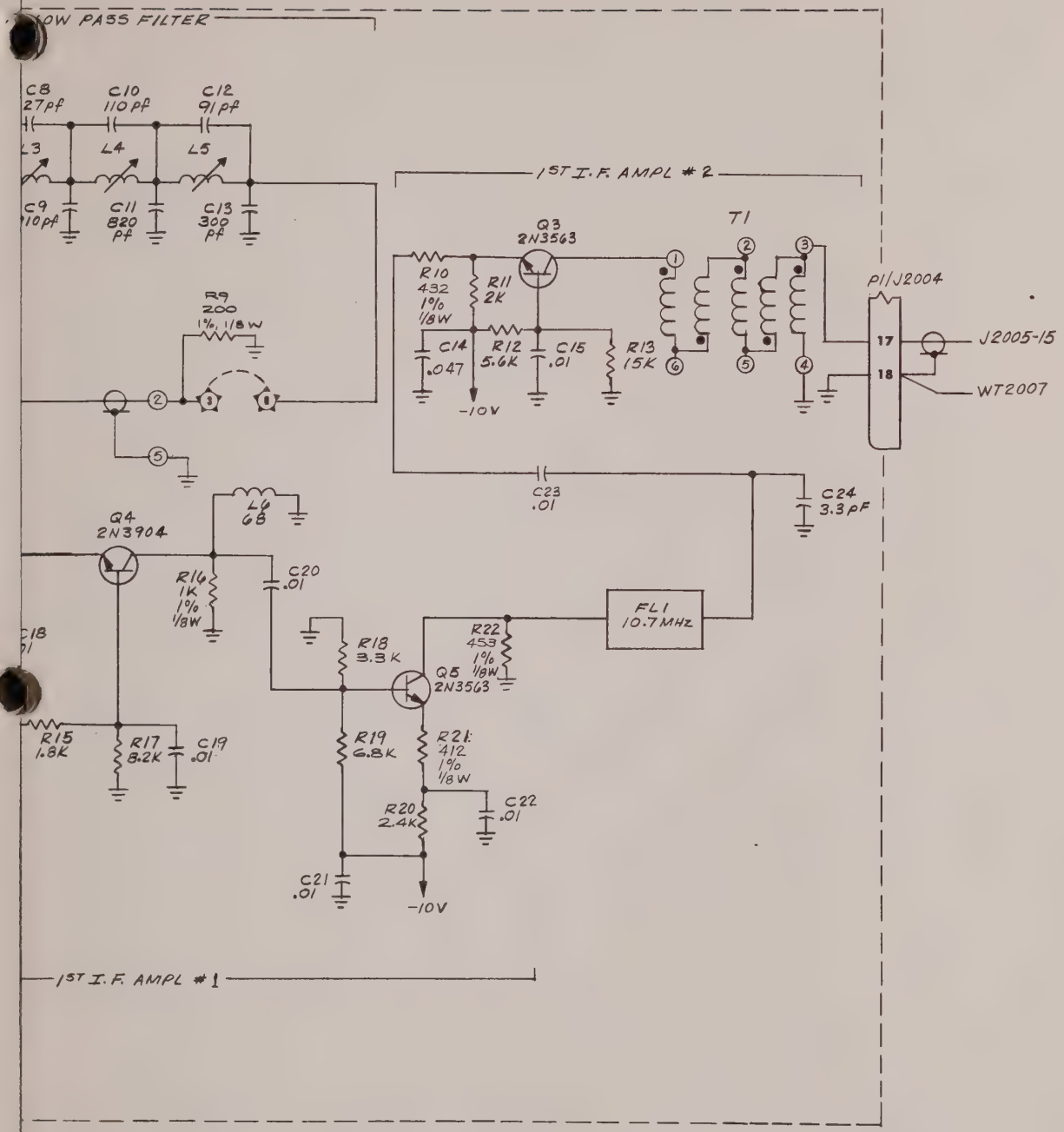


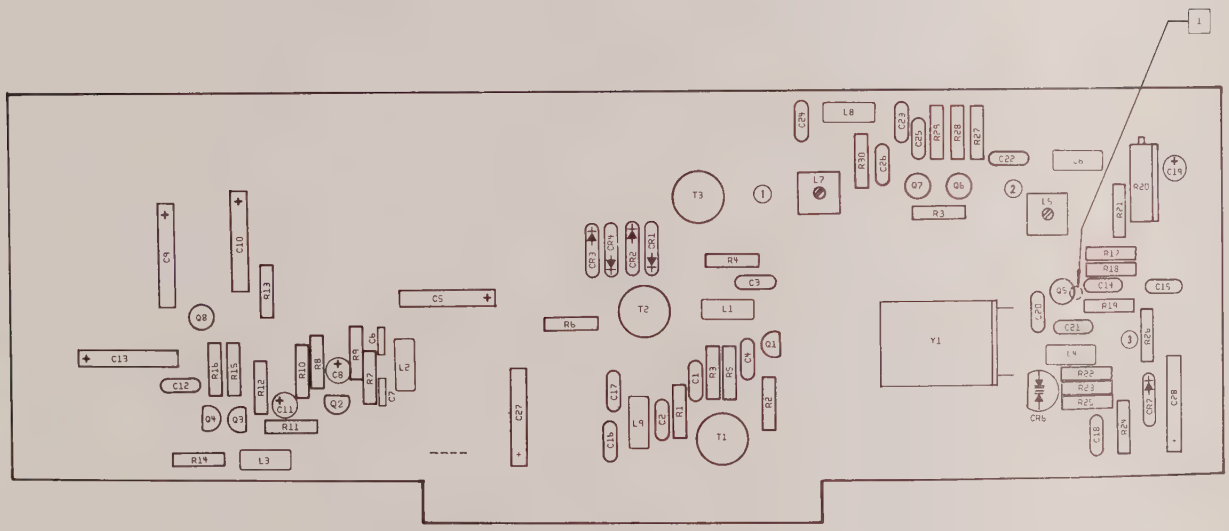
Figure 3-6. First I. F. Amplifier, 2300

SECOND MIXER AND SECOND L. O. 2400

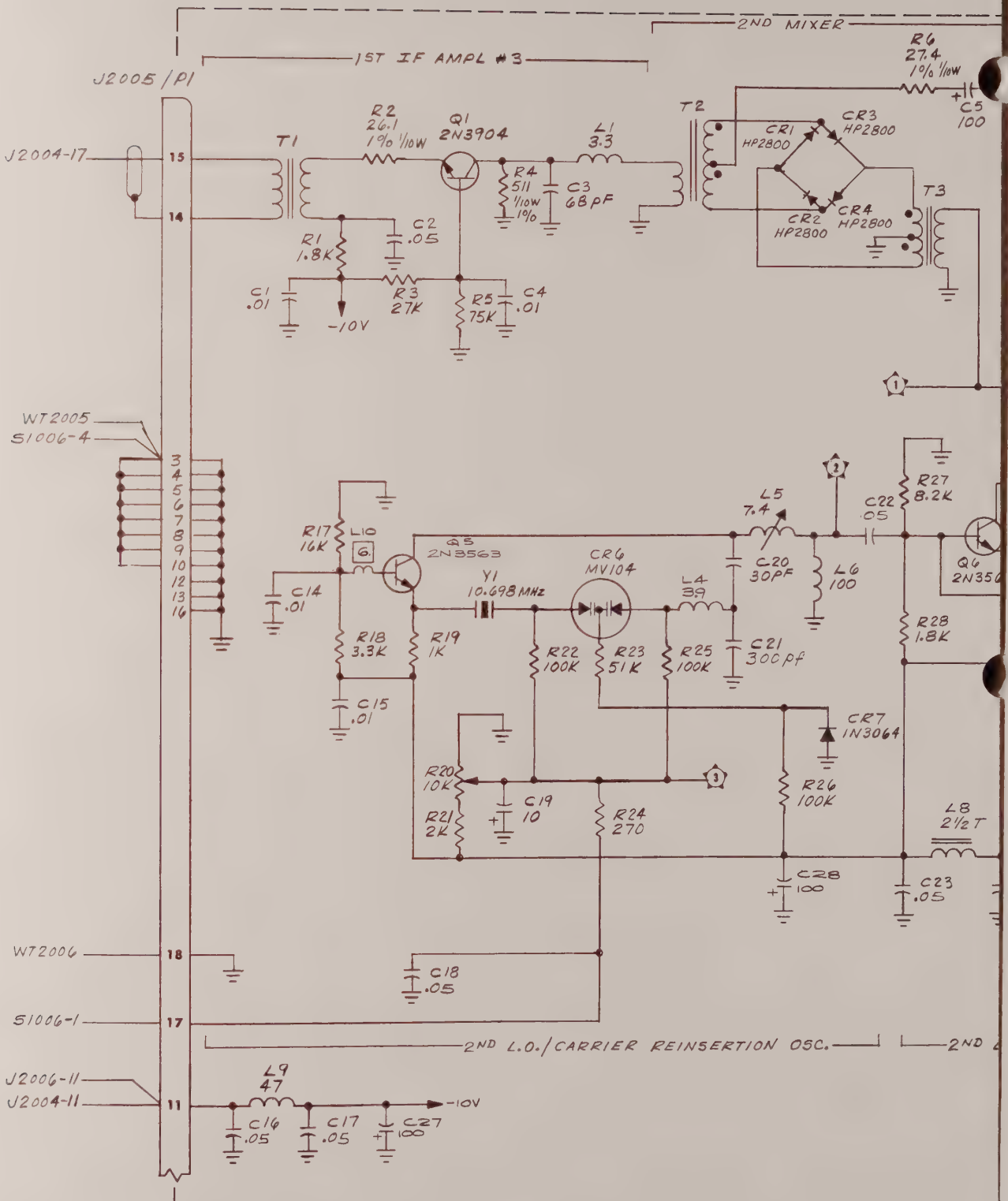
CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
2400	2nd Mixr & 2nd L.O. Assembly	7001-0249	Cushman	
	P. C. Board	1780-0477	Cushman	
	CAPACITORS			
C1	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C2	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C3	Mica, 68pF, ±5%, 500V	1002-0013	Elmenco	DM15-E-680J
C4	Cer, .01μF,+80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C5	Elec, 100μF, +75-10%, 12V	1013-0011	Sprague	30D107G012CC5
C6	Cer, .01μF, ±10%, 100V	1005-0065	Aerovox	CK06BX103K
C7	Cer, 6800pF, ±10%, 200V	1005-0099	Aerovox	CK06BX682K
C8	Tant, 10μF, +50-20%, 35V	1011-0006	ITT	TAG-10/35-20
C9	Elec, 100μF, +75-10%, 12V	1013-0011	Sprague	30D107G012CC5
C10	Elec, 100μF, +75-10%, 12V	1013-0011	Sprague	30D107G012CC5
C11	Tant, 10μF, +50-20%, 35V	1011-0006	ITT	TAG-10/35-20
C12	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C13	Elec, 100μF, +75-10%, 12V	1013-0011	Sprague	30D107G012CC5
C14	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C15	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C16	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C17	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C18	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C19	Tant, 10μF, +50-20%, 35V	1011-0006	ITT	TAG-10/35-20
C20	Mica, 30pF, ±5%, 500V	1002-0043	Elmenco	DM15-E-300J
C21	Mica, 300pF, ±5%, 500V	1002-0059	Elmenco	DM15-E-301J
C22	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C23	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C24	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C25	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C26	Mica, 30pF, ±5%, 500V	1002-0043	Elmenco	DM15-E-300J
C27	Elec, 100μF, +75-10%, 12V	1013-0011	Sprague	30D107G012CC5
C28	Elec, 100μF, +75-10%, 12V	1013-0011	Sprague	30D107G012CC5
	CRYSTAL			
Y1	Crystal, 10.698 MHz	2035-0020	Cushman	
	DIODES			
CR1	Hot-Carrier, HPA 2800	1283-0001	HPA	5082-2800
CR2	Hot-Carrier, HPA 2800	1283-0001	HPA	5082-2800
CR3	Hot-Carrier, HPA 2800	1283-0001	HPA	5082-2800
CR4	Hot-Carrier, HPA 2800	1283-0001	HPA	5082-2800
CR5	Not Used			
CR6	Si, Varicap, Dual, MV104	1281-0058	Motorola	MV104
CR7	Si, Signal, 75V, 1N3064	1281-0013	Teledyne	1N3064
	INDUCTORS			
L1	RF Choke, 3.3μH, ±10%	1585-0037	Delevan	1537-24
L2	RF Choke, 6.8μH, ±10%	1585-0015	Delevan	1537-32
L3	Choke, Wide Band 2 1/2 T	1586-0001	Ferroxcube	VK200 10/3B
L4	RF Choke, 3.9μH, ±10%	1585-0014	Delevan	1537-26
L5	Coil, Var.	1596-7901	Cushman	

SECOND MIXER AND SECOND L. O. 2400 (cont.)

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
L6	RF Choke, 100μH, ±5%	1585-0017	Delevan	1537-76
L7	Coil, Var.	1596-7901	Cushman	
L8	Choke, Wide Band 2 1/2 T	1586-0001	Ferroxcube	VK200 10/3B
L9	RF Choke, 47μH, ±5%	1585-0010	Delevan	1537-60
L10	Choke, Ferrite Bead U-250	1586-0004	Ferroxcube	56-590-65/4B
	RESISTORS			
R1	Comp, 1.8k, ±5%, 1/4W	1066-1825	Allen-Bradley	CB1825
R2	MF, 26.1Ω, ±1%, 150 PPM, 1/10W	1074-1011	Dale	RN55D26R1-F
R3	Comp, 27k, ±5%, 1/4W	1066-2735	Allen-Bradley	CB2735
R4	MF, 511Ω, ±1%, 150 PPM, 1/10W	1074-1008	Dale	RN55D5110-F
R5	Comp, 75k, ±5%, 1/4W	1066-7535	Allen-Bradley	CB7535
R6	MF, 27.4Ω, ±1%, 150PPM, 1/10W	1074-1012	Dale	RN55D27R4-F
R7	Comp, 620Ω, ±5%, 1/4W	1066-6215	Allen-Bradley	CB6215
R8	Comp, 27k, ±5%, 1/4W	1066-2735	Allen-Bradley	CB2735
R9	Comp, 9.1k, ±5%, 1/4W	1066-9125	Allen-Bradley	CB9125
R10	MF, 2k, ±1%, 100 PPM, 1/10W	1075-0079	Dale	MFF 1/10
R11	Comp, 43k, ±5%, 1/4W	1066-4335	Allen-Bradley	CB4335
R12	Comp, 68k, ±5%, 1/4W	1066-6835	Allen-Bradley	CB6835
R13	Comp, 5.6k, ±5%, 1/4W	1066-5625	Allen-Bradley	CB5625
R14	Comp, 510Ω, ±5%, 1/4W	1066-5115	Allen-Bradley	CB5115
R15	Comp, 3.3k, ±5%, 1/4W	1066-3325	Allen-Bradley	CB3325
R16	Comp, 510Ω, ±5%, 1/4W	1066-5115	Allen-Bradley	CB5115
R17	Comp, 16k, ±5%, 1/4W	1066-1635	Allen-Bradley	CB1635
R18	Comp, 3.3k, ±5%, 1/4W	1066-3325	Allen-Bradley	CB3325
R19	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R20	Pot, 10k, ±10%, 3/4W	1215-0014	Helitrim	89WR
R21	Comp, 2k, ±5%, 1/4W	1066-2025	Allen-Bradley	CB2025
R22	Comp, 100k, ±5%, 1/4W	1066-1045	Allen-Bradley	CB1045
R23	Comp, 51k, ±5%, 1/4W	1066-5135	Allen-Bradley	CB5135
R24	Comp, 270Ω, ±5%, 1/4W	1066-2715	Allen-Bradley	CB2715
R25	Comp, 100k, ±5%, 1/4W	1066-1045	Allen-Bradley	CB1045
R26	Comp, 100k, ±5%, 1/4W	1066-1045	Allen-Bradley	CB1045
R27	Comp, 8.2k, ±5%, 1/4W	1066-8225	Allen-Bradley	CB8225
R28	Comp, 1.8k, ±5%, 1/4W	1066-1825	Allen-Bradley	CB1825
R29	Comp, 330Ω, ±5%, 1/4W	1066-3315	Allen-Bradley	CB3315
R30	Comp, 5.1k, ±5%, 1/4W	1066-5125	Allen-Bradley	CB5125
R31	Comp, 100Ω, ±5%, 1/4W	1066-1015	Allen-Bradley	CB1015
	TRANSFORMERS			
T1	Toroid, Trifilar	1579-0017	Cushman	
T2	Toroid, Trifilar	1579-0017	Cushman	
T3	Toroid, Trifilar	1579-0017	Cushman	
	TRANSISTORS			
Q1	Si, NPN, 2N3904	1272-0032	Motorola	2N3904
Q2	Si, PNP, 2N3906	1272-0037	Motorola	2N3907
Q3	Si, PNP, 2N3906	1272-0037	Motorola	2N3907
Q4	Si, NPN, 2N5962	1272-0059	Fairchild	2N5962
Q5	Si, NPN, 2N3563	1272-0022	Fairchild	2N3563
Q6	Si, NPN, 2N3563	1272-0022	Fairchild	2N3563
Q7	Si, NPN, 2N2563	1272-0022	Fairchild	2N3563
Q8	Si, PNP, 2N4249	1272-0024	Fairchild	2N4249



1. L10 ON BASE OF Q5 TRANSISTOR.



NOTE:

1. RESISTORS - 1/4W, 5% VALUES IN OHMS UNLESS OTHERWISE NOTED.
2. CAPACITORS - VALUES IN μF UNLESS OTHERWISE NOTED.
3. INDUCTORS - VALUES IN μH UNLESS OTHERWISE NOTED.
4. *FACTORY SELECT. TYPICAL VALUE SHOWN.
5. ALL VOLTAGES ARE DC UNLESS OTHERWISE NOTED.
6. FERRITE BEAD.
7. ALL 100/20 CAPACITORS LAYOUT COMPATIBLE TO 100/12 ALUM CAPS.

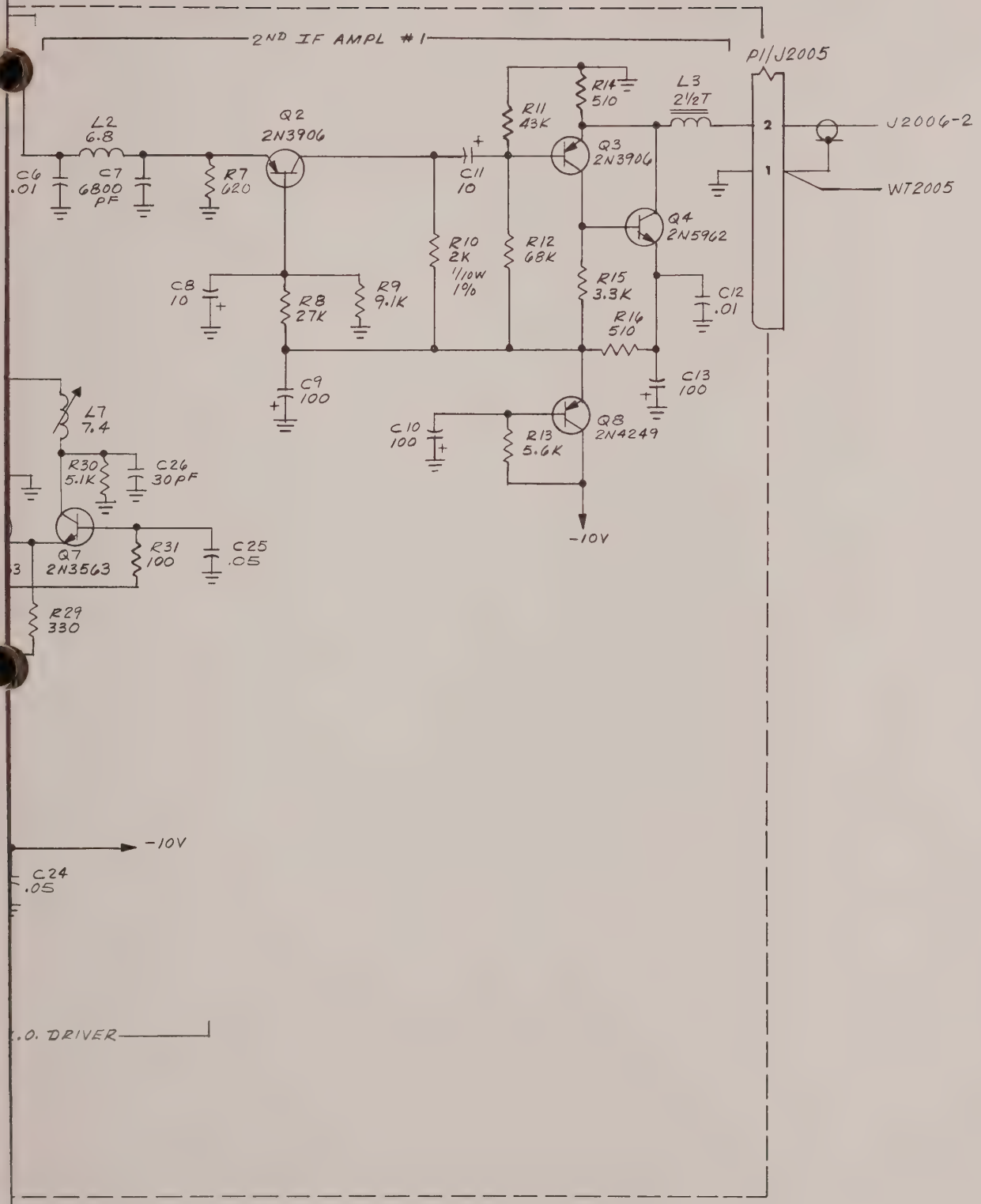


Figure 3-7. Second Mixer and Second L. O. 2400

SECOND I. F. AND GAIN SWITCH. 2500

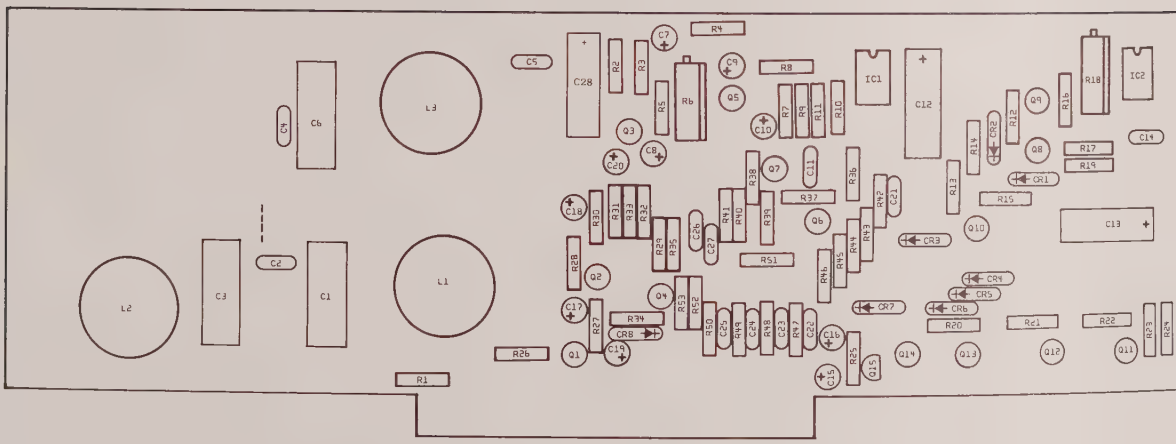
CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
2500	2nd I. F. & Gain Switch	7001-0250	Cushman	
	P. C. Board	1780-0478	Cushman	
	CAPACITORS			
C1	Poly, .027μF, ±1%, 50V	1008-0064	TRW	863UW
C2	Mica, 270pF, ±5%, 500V	1002-0031	Elmenco	DM15-F-271J
C3	Poly, .027μF, ±1%, 50V	1008-0064	TRW	863UW
C4	Mica, 470pF, ±5%, 500V	1002-0035	Elmenco	DM15-F-471J
C5	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C6	Poly, .027μF, ±1%, 50V	1008-0064	TRW	863UW
C7	Tant, 10μF, +50-20%, 35V	1011-0006	ITT	TAG-10/35-20
C8	Tant, 10μF, +50-20%, 35V	1011-0006	ITT	TAG-10/35-20
C9	Tant, 1μF, ±20%, 50V	1011-0013	Kemet	T368A105M050AS
C10	Tant, 10μF, +50-20%, 35V	1011-0006	ITT	TAG-10/35-20
C11	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C12	Elec, 100μF, +75-10%, 12V	1013-0011	Sprague	30D107G012CC5
C13	Elec, 100μF, +75-10%, 12V	1013-0011	Sprague	30D107G012CC5
C14	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C15	Tant, 10μF, +50-20%, 35V	1011-0006	ITT	TAG-10/35-20
C16	Tant, 100μF, ±20%, 20V	1011-0010	Kemet	T362D107M020AS
C17	Tant, 1μF, ±20%, 50V	1011-0013	Kemet	T368A105M050AS
C18	Tant, 10μF, +50-20%, 35V	1011-0006	ITT	TAG-10/35-20
C19	Tant, 1μF, ±20%, 50V	1011-0013	Kemet	T368A105M050AS
C20	Tant, 10μF, +50-20%, 35V	1011-0006	ITT	TAG-10/35-20
C21	Cer, .1μF, ±20%, 25V	1005-0044	Sprague	50023104X0250B3
C22	Cer, .1μF, ±20%, 25V	1005-0044	Sprague	50023104X0250B3
C23	Cer, .1μF, ±20%, 25V	1005-0044	Sprague	50023104X0250B3
C24	Cer, .1μF, ±20%, 25V	1005-0044	Sprague	50023104X0250B3
C25	Cer, .1μF, ±20%, 25V	1005-0044	Sprague	50023104X0250B3
C26	Cer, .1μF, ±20%, 25V	1005-0044	Sprague	50023104X0250B3
C27	Cer, .1μF, ±20%, 25V	1005-0044	Sprague	50023104X0250B3
C28	Elec, 100μF, +75-10%, 12V	1013-0011	Sprague	30D107G012CC5
	DIODES			
CR1	Si, Signal, 75V, 1N3064	1281-0013	Teledyne	1N3064
CR2	Si, Signal, 75V, 1N3064	1281-0013	Teledyne	1N3064
CR3	Si, Signal, 75V, 1N3064	1281-0013	Teledyne	1N3064
CR4	Si, Signal, 75V, 1N3064	1281-0013	Teledyne	1N3064
CR5	Si, Signal, 75V, 1N3064	1281-0013	Teledyne	1N3064
CR6	Si, Signal, 75V, 1N3064	1281-0013	Teledyne	1N3064
CR7	Si, Signal, 75V, 1N3064	1281-0013	Teledyne	1N3064
CR8	Si, Signal, 75V, 1N3064	1281-0013	Teledyne	1N3064
	INDUCTOR			
L1	Pot Core	1596-0084	Cushman	
L2	Pot Core	1596-0084	Cushman	
L3	Pot Core	1596-0084	Cushman	
	INTEGRATED CIRCUITS			
IC1	Op Amp SN72741P	2025-0067	T. I.	SN72741P
IC2	Op Amp SN72741P	2025-0067	T. I.	SN72741P

SECOND I. F. AND GAIN SWITCH. 2500 (cont.)

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
	RESISTORS			
R1	MF, 43.2Ω, ±1%, 100 PPM, 1/8W	1075-0069	Dale	MFF 1/8 T1
R2	MF, 294k, ±1%, 100 PPM, 1/8W	1075-0028	Dale	MFF 1/8 T1
R3	MF, 2.74k, ±1%, 100 PPM, 1/8W	1075-0071	Dale	MFF 1/8 T1
R4	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R5	Comp, 20k, ±5%, 1/4W	1066-2035	Allen-Bradley	CB2035
R6	Pot, 5k, ±10%, 3/4W	1215-0012	Helitrim	89WR
R7	Comp, 82k, ±5%, 1/4W	1066-8235	Allen-Bradley	CB8235
R8	MF, 4.75k, ±1%, 100 PPM, 1/8W	1075-0038	Dale	MFF 1/8 T1
R9	Comp, 47k, ±5%, 1/4W	1066-4735	Allen-Bradley	CB4735
R10	MF, 39.2k, ±1%, 25 PPM, 1/10W	1074-1032	Dale	MFF 1/10
R11	Comp, 120k, ±5%, 1/4W	1066-1245	Allen-Bradley	CB1245
R12	MF, 10k, ±.1%, 25 PPM, 1/10W	1074-0060	Dale	MF 1/10 T9
R13	MF, 31.62k, ±.1%, 25 PPM, 1/10W	1074-0063	Dale	MF 1/10 T9
R14	MF, 100k, ±.1%, 25 PPM, 1/10W	1074-0069	Dale	MF 1/10 T9
R15	MF, 4.585k, ±.1%, 25 PPM, 1/8W	1075-0118	Dale	MFF 1/8 T9
R16	MF, 3.01k, ±1%, 100 PPM, 1/8W	1075-0127	Dale	MFF 1/8 RN55D
R17	Comp, 30k, ±5%, 1/4W	1066-3035	Allen-Bradley	CB3035
R18	Pot, 50k, ±10%, 3/4W	1215-0023	Helitrim	89WR
R19	Comp, 20k, ±5%, 1/4W	1066-2035	Allen-Bradley	CB2035
R20	MF, 1.322k, ±.1%, 25 PPM, 1/8W	1075-0120	Dale	MFF 1/8 T9
R21	MF, 261 Ω, ±1%, 100 PPM, 1/10W	1074-1054	Dale	MF 1/10
R22	MF, 340 Ω, ±1%, 100 PPM, 1/10W	1074-1055	Dale	MF 1/10
R23	MF, 6.541k, ±.1%, 25 PPM, 1/8W	1075-0119	Dale	MFF 1/8 T9
R24	MF, 4.585k, ±.1%, 25 PPM, 1/8W	1075-0118	Dale	MFF 1/8 T9
R25	Comp, 10k, ±5%, 1/4W	1066-1035	Allen-Bradley	CB1035
R26	Comp, 1MΩ, ±5%, 1/4W	1066-1055	Allen-Bradley	CB1055
R27	Comp, 100k, ±5%, 1/4W	1066-1045	Allen-Bradley	CB1045
R28	Comp, 100k, ±5%, 1/4W	1066-1045	Allen-Bradley	CB1045
R29	MF, 4.99k, ±1%, 100 PPM, 1/8W	1075-0095	Dale	MFF 1/8 T1
R30	MF, 237Ω, ±1%, 150 PPM, 1/10W	1074-1041	Dale	MF 1/10 T0
R31	Comp, 9.1k, ±5%, 1/4W	1066-9125	Allen-Bradley	CB9125
R32	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R33	Comp, 24k, ±5%, 1/4W	1066-2435	Allen-Bradley	CB2435
R34	Comp, 1MΩ, ±5%, 1/4W	1066-1055	Allen-Bradley	CB1055
R35	Comp, 1MΩ, ±5%, 1/4W	1066-1055	Allen-Bradley	CB1055
R36	Comp, 51k, ±5%, 1/4W	1066-5135	Allen-Bradley	CB5135
R37	Comp, 51k, ±5%, 1/4W	1066-5135	Allen-Bradley	CB5135
R38	Comp, 51k, ±5%, 1/4W	1066-5135	Allen-Bradley	CB5135
R39	Comp, 51k, ±5%, 1/4W	1066-5135	Allen-Bradley	CB5135
R40	Comp, 1MΩ, ±5%, 1/4W	1066-1055	Allen-Bradley	CB1055
R41	Comp, 1MΩ, ±5%, 1/4W	1066-1055	Allen-Bradley	CB1055
R42	Comp, 1MΩ, ±5%, 1/4W	1066-1055	Allen-Bradley	CB1055
R43	Comp, 1MΩ, ±5%, 1/4W	1066-1055	Allen-Bradley	CB1055
R44	Comp, 1MΩ, ±5%, 1/4W	1066-1055	Allen-Bradley	CB1055
R45	Comp, 1MΩ, ±5%, 1/4W	1066-1055	Allen-Bradley	CB1055
R46	Comp, 1MΩ, ±5%, 1/4W	1066-1055	Allen-Bradley	CB1055
R47	Comp, 100k, ±5%, 1/4W	1066-1045	Allen-Bradley	CB1045
R48	Comp, 100k, ±5%, 1/4W	1066-1045	Allen-Bradley	CB1045
R49	Comp, 100k, ±5%, 1/4W	1066-1045	Allen-Bradley	CB1045
R50	Comp, 100k, ±5%, 1/4W	1066-1045	Allen-Bradley	CB1045
R51	Comp, 100k, ±5%, 1/4W	1066-1045	Allen-Bradley	CB1045
R52	Comp, 100k, ±5%, 1/4W	1066-1045	Allen-Bradley	CB1045
R53	Comp, 100k, ±5%, 1/4W	1066-1045	Allen-Bradley	CB1045
R54	MF, 28.7k, ±1%, 100 PPM, 1/10W	1074-1057	Dale	MF 1/10
R55	MF, 22.6k, ±1%, 100 PPM, 1/10W	1074-1056	Dale	MF 1/10

SECOND I. F. AND GAIN SWITCH. 2500 (cont.)

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
	TRANSISTORS			
Q1	Si, PNP, 2N4249	1272-0024	Fairchild	2N4249
Q2	Si, NPN, 2N3565	1272-0017	Fairchild	2N3565
Q3	J-FET, N-Chan, 2N4416	1272-0048	Teledyne	2N4416
Q4	Si, PNP, 2N4249	1272-0024	Fairchild	2N4249
Q5	J-FET, N-Chan, 2N4392	1272-0054	Teledyne	2N4392
Q6	Si, NPN, 2N3565	1272-0017	Fairchild	2N3565
Q7	Si, NPN, 2N3565	1272-0017	Fairchild	2N3565
Q8	J-FET, N-Chan, 2N4392	1272-0054	Teledyne	2N4392
Q9	J-FET, N-Chan, 2N4392	1272-0054	Teledyne	2N4392
Q10	J-FET, N-Chan, 2N4392	1272-0054	Teledyne	2N4392
Q11	J-FET, N-Chan, 2N4392	1272-0054	Teledyne	2N4392
Q12	J-FET, N-Chan, 2N4392	1272-0054	Teledyne	2N4392
Q13	J-FET, N-Chan, 2N4392	1272-0054	Teledyne	2N4392
Q14	J-FET, N-Chan, 2N4392	1272-0054	Teledyne	2N4392
Q15	Si, NPN, 2N5962	1272-0059	Fairchild	2N5962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C3
C2
C1
L1
C4
C6
L3
C5
C28
R2
R3
C7
R4
R5
R6
C9
Q5
R8
IC1
C12
R18
IC2
C14
Q3
C8
C20
C10
R7
R9
R11
R10
Q9
R16
R12
CR2
R14
Q8
R17
R19
CR1
R15
C13
Q10
CR3
R13
C21
R42
R43
R44
R45
R46
CR4
CR5
CR6
CR7
R20
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C26
C27
R51
R41
R40
R38
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C11
R36
R37
Q6
R39
R31
R33
R32
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C19
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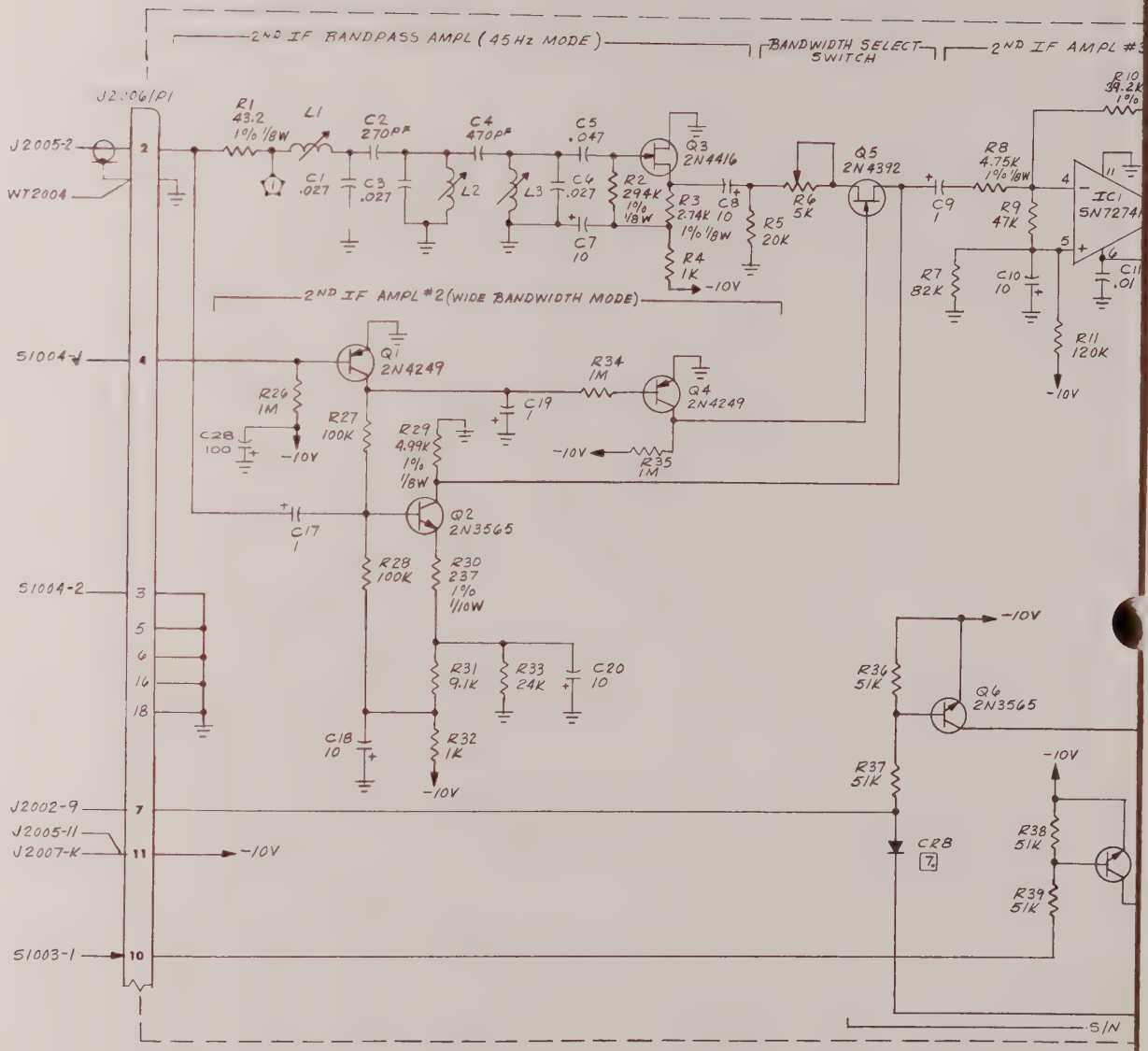
R26
R1



NOTE:

1. RESISTORS - 1/4W, 5% VALUES IN OHMS UNLESS OTHERWISE NOTED.
2. CAPACITORS - VALUES IN μF UNLESS OTHERWISE NOTED.
3. INDUCTORS - VALUES IN μH UNLESS OTHERWISE NOTED.
4. *FACTORY SELECT. TYPICAL VALUE SHOWN.
5. ALL VOLTAGES ARE DC UNLESS OTHERWISE NOTED.
6. ALL 100/20 CAPACITORS LAYOUT COMPATIBLE TO 100/12 ALUM CAPS. EXCEPT C16.
7. ALL DIODES ARE 1N3064 UNLESS OTHERWISE NOTED.

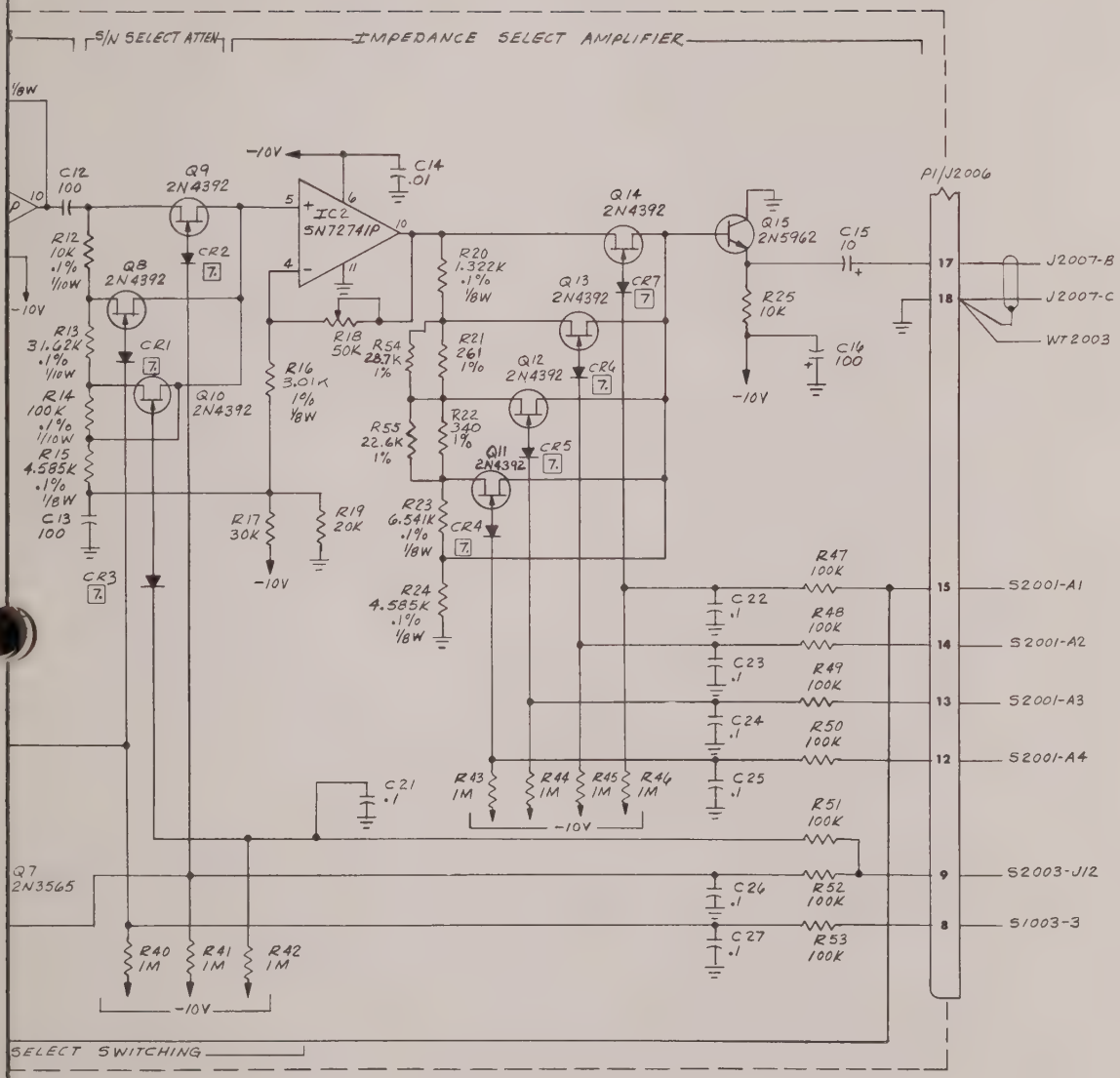
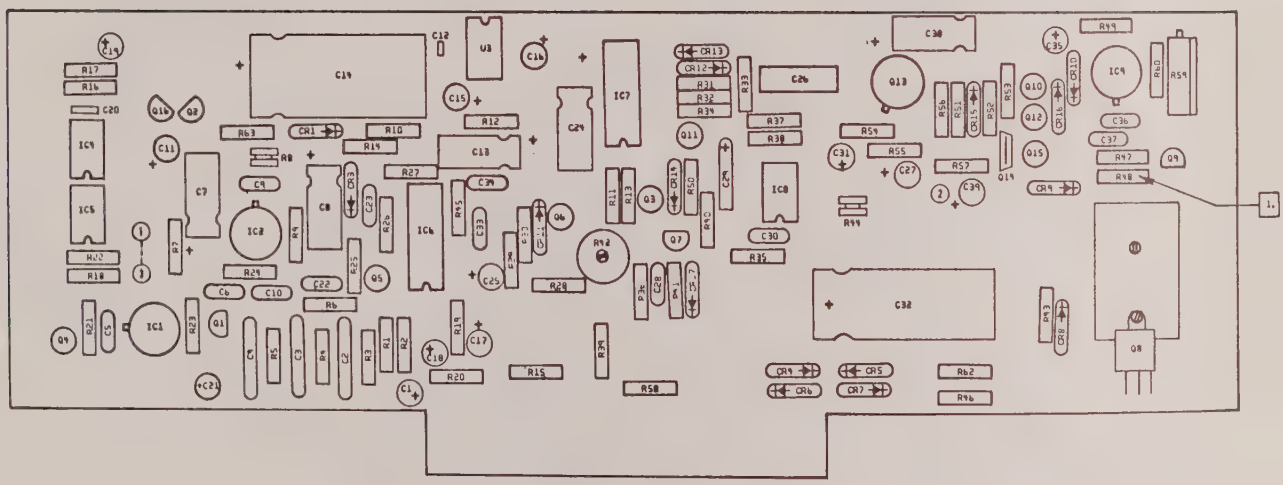


Figure 3-8. Second I. F. and Gain Switch. 2500

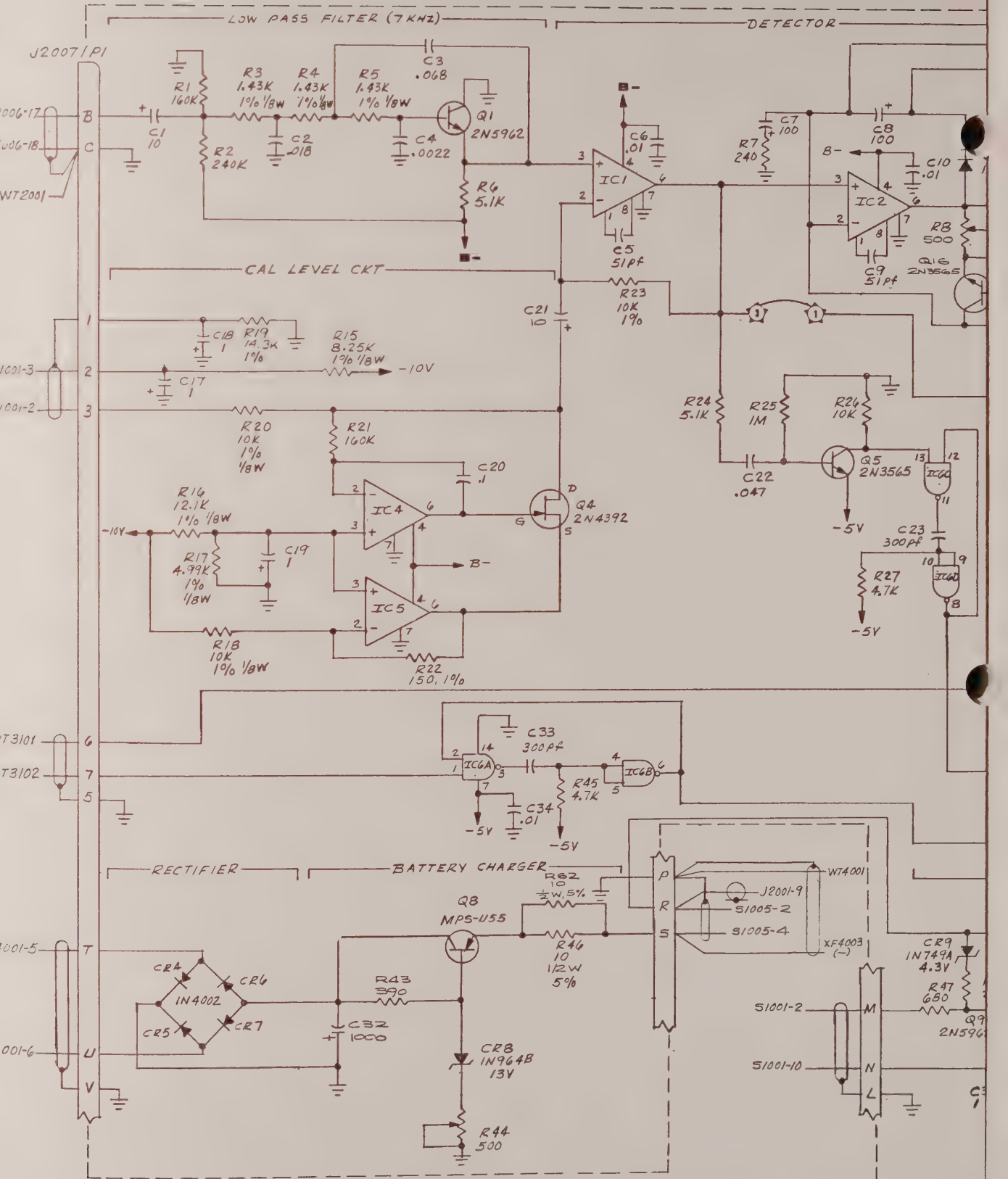
CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
A600	PCB ASSY - AUDIO/METER	7001-0251	CUSHMAN	CE-24A
	PRINTED CIRCUIT BOARD	1780-0479	CUSHMAN	
	CAPACITOR			
C 1	CAP-10UF 20% 35V RDL TANT	1011-0006	MATSUO	221L3502106M3
C 2	CAP-.018UF 10% 100V RDL POLYESTER	1008-0008	SPRAGUE	225P18391WD3
C 3	CAP-.068UF 10% 100V RDL POLYESTER	1008-0036	SPRAGUE	225P68391WA3
C 4	CAP-.0022UF 10% 100V RDL POLYESTER	1008-0020	SPRAGUE	225P22291WA3
C 5	CAP-51PF 5% 500V DIP MICA	1002-0045	ELMENCO	DM15-E-510J
C 6	CAP-.01UF +80-20% 25V Y5U CER DISC	1005-0013	ERIE	5835-512-Y5U-103Z
C 7	CAP-100UF +75-10% 16V AXL ELCTLT	1013-0011	NICHICON	16ELA100
C 8	CAP-100UF +75-10% 16V AXL ELCTLT	1013-0011	NICHICON	16ELA100
C 9	CAP-51PF 5% 500V DIP MICA	1002-0045	ELMENCO	DM15-E-510J
C 10	CAP-.01UF +80-20% 25V Y5U CER DISC	1005-0013	ERIE	5835-512-Y5U-103Z
C 11	CAP-10UF 20% 35V RDL TANT	1011-0006	MATSUO	221L3502106M3
C 12	CAP-.01UF 20% 100V Y5P MINTR CER WHT	1005-0100	ERIE	8121-100-651-103M
C 13	CAP-100UF +75-10% 16V AXL ELCTLT	1013-0011	NICHICON	16ELA100
C 14	CAP-1000UF +50-10% 25V ELCTLT	1014-0006	ILLINOIS	108TTA025A
C 15	CAP-10UF 20% 35V RDL TANT	1011-0006	MATSUO	221L3502106M3
C 16	CAP-10UF 20% 35V RDL TANT	1011-0006	MATSUO	221L3502106M3
C 17	CAP-1UF 20% 50V RDL TANT	1011-0013	KEMET	T368A105M050AS
C 18	CAP-1UF 20% 50V RDL TANT	1011-0013	KEMET	T368A105M050AS
C 19	CAP-1UF 20% 50V RDL TANT	1011-0013	KEMET	T368A105M050AS
C 20	CAP-.1UF 10% 100V MLD CER	1005-0064	AEROVOX	CK06BX104K
C 21	CAP-10UF 20% 35V RDL TANT	1011-0006	MATSUO	221L3502106M3
C 22	CAP-.05UF +80-20% 25V Y5U CER DISC	1005-0014	ERIE	5835-514-Y5U-503Z
C 23	CAP-300PF 5% 500V DIP MICA	1002-0059	ELMENCO	DM15-F-301J
C 24	CAP-100UF +75-10% 16V AXL ELCTLT	1013-0011	NICHICON	16ELA100
C 25	CAP-10UF 20% 35V RDL TANT	1011-0006	MATSUO	221L3502106M3
C 26	CAP-.22UF 10% 100V RDL MET-MYLAR	1008-0091	ELECTROCUBE	232A1B224K
C 27	CAP-10UF 20% 35V RDL TANT	1011-0006	MATSUO	221L3502106M3
C 28	CAP-.05UF +80-20% 25V Y5U CER DISC	1005-0014	ERIE	5835-514-Y5U-503Z
C 29	CAP-10UF 10% 20V AXL TANT	1011-0007	KEMET	T310B106K020AS
C 30	CAP-100PF 5% 500V DIP MICA	1002-0011	ELMENCO	DM15-F-101J
C 31	CAP-10UF 20% 35V RDL TANT	1011-0006	MATSUO	221L3502106M3
C 32	CAP-1000UF +50-10% 35V AXL ELCTLT	1013-0027	NIPPON CHEMICON	CE02W35V
C 33	CAP-300PF 5% 500V DIP MICA	1002-0059	ELMENCO	DM15-F-301J
C 34	CAP-.01UF +80-20% 25V Y5U CER DISC	1005-0013	ERIE	5835-512-Y5U-103Z
C 35	CAP-1UF 20% 50V RDL TANT	1011-0013	KEMET	T368A105M050AS
C 36	CAP-51PF 5% 500V DIP MICA	1002-0045	ELMENCO	DM15-E-510J
C 37	CAP-.05UF +80-20% 25V Y5U CER DISC	1005-0014	ERIE	5835-514-Y5U-503Z
C 38	CAP-100UF +75-10% 16V AXL ELCTLT	1013-0011	NICHICON	16ELA100
C 39	CAP-10UF 20% 35V RDL TANT	1011-0006	MATSUO	221L3502106M3
	DIODE			
CR 1	DIO-1N3064 SI SW D07/D035 75PRV .25W	1281-0013	FAIRCHILD	1N3064
CR 3	DIO-1N3064 SI SW D07/D035 75PRV .25W	1281-0013	FAIRCHILD	1N3064
CR 4	DIO-1N4002 SI RECT A23F 100PRV 1A	1281-0023	ITT	1N4002
CR 5	DIO-1N4002 SI RECT A23F 100PRV 1A	1281-0023	ITT	1N4002
CR 6	DIO-1N4002 SI RECT A23F 100PRV 1A	1281-0023	ITT	1N4002
CR 7	DIO-1N4002 SI RECT A23F 100PRV 1A	1281-0023	ITT	1N4002
CR 8	DIO-1N964B SI ZENER D07 13V 5% .4W	1281-0070	MOTOROLA	1N964B
CR 9	DIO-1N749A SI ZENER D07 4.3V 5% .4W	1281-0034	MOTOROLA	1N749A
CR 10	DIO-1N827 SI ZENER D07 6.2V 5% .4W TC	1281-0038		
CR 11	DIO-1N3064 SI SW D07/D035 75PRV .25W	1281-0013	FAIRCHILD	1N3064
CR 12	DIO-1N3064 SI SW D07/D035 75PRV .25W	1281-0013	FAIRCHILD	1N3064
CR 13	DIO-1N3064 SI SW D07/D035 75PRV .25W	1281-0013	FAIRCHILD	1N3064

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
CR 14	DIO-1N3064 SI SW D07/D035 75PRV .25W	1281-0013	FAIRCHILD	1N3064
CR 15	DIO-1N3064 SI SW D07/D035 75PRV .25W	1281-0013	FAIRCHILD	1N3064
CR 16	DIO-1N958B SI ZENER D07 7.5V 5% .4W	1281-0071	MOTOROLA	1N958B
CR 17	DIO-1N3064 SI SW D07/D035 75PRV .25W	1281-0013	FAIRCHILD	1N3064
	TRANSISTOR			
Q 1	XSTR-2N5962 NPN SI T092 LOW PWR	1272-0059	FAIRCHILD	2N5962
Q 2	XSTR-2N3565 NPN SI R110 LOW PWR	1272-0017	FAIRCHILD	2N3565
Q 3	XSTR-2N3565 NPN SI R110 LOW PWR	1272-0017	FAIRCHILD	2N3565
Q 4	XSTR-2N4392 SI T018 J-FET N-CHAN	1272-0054	TELEDYNE	2N4392
Q 5	XSTR-2N3565 NPN SI R110 LOW PWR	1272-0017	FAIRCHILD	2N3565
Q 6	XSTR-2N4249 PNP SI R124B LOW PWR	1272-0024	CARTER SEMI	2N4249
Q 7	XSTR-2N5962 NPN SI T092 LOW PWR	1272-0059	FAIRCHILD	2N5962
Q 8	XSTR-MPS-U55 PNP SI B18 HIGH PWR	1272-0074		
Q 9	XSTR-2N5962 NPN SI T092 LOW PWR	1272-0059	FAIRCHILD	2N5962
Q 10	XSTR-2N4416 SI TO 72 J-FET N-CHAN	1272-0048	INTERSIL	2N4416
Q 11	XSTR-2N4392 SI T018 J-FET N-CHAN	1272-0054	TELEDYNE	2N4392
Q 12	XSTR-2N3565 NPN SI R110 LOW PWR	1272-0017	FAIRCHILD	2N3565
Q 13	XSTR-2N3644 PNP SI R110A LOW PWR/SW	1272-0040	FAIRCHILD	2N3644
Q 14	XSTR-MPS-U55 PNP SI B18 HIGH PWR	1272-0074		
Q 15	XSTR-2N4121 PNP SI R110 LOW PWR/SW	1272-0023	FAIRCHILD	PN4121
Q 16	XSTR-2N3565 NPN SI R110 LOW PWR	1272-0017	FAIRCHILD	2N3565
	RESISTOR			
R 1	RES-160K 5% 1/4W CC	1066-1645	ALLEN BRADLEY	CB1645
R 2	RES-240K 5% 1/4W CC	1066-2445	ALLEN BRADLEY	CB2445
R 3	RES-1.43K 1% 100PPM FILM	1075-0021	CAT.LIST	55-100
R 4	RES-1.43K 1% 100PPM FILM	1075-0021	CAT.LIST	55-100
R 5	RES-1.43K 1% 100PPM FILM	1075-0021	CAT.LIST	55-100
R 6	RES-5.1K 5% 1/4W CC	1066-5125	ALLEN BRADLEY	CB 5125
R 7	RES-240 OHM 5% 1/4W CC	1066-2415	ALLEN BRADLEY	CB2415
R 8	POT-500 OHM 20% 1/4W 1T CC TRMR	1215-0026	CTS	X201R501B
R 9	RES-1K 5% 1/4W CC	1066-1025	ALLEN BRADLEY	CB1025
R 10	RES-10 OHM 5% 1/4W CC	1066-1005	ALLEN BRADLEY	CB1005
R 11	RES-10K 5% 1/4W CC	1066-1035	ALLEN BRADLEY	CB1035
R 12	RES-1.1K 5% 1/4W CC	1066-1125	ALLEN BRADLEY	CB1125
R 13	RES-4.3K 5% 1/4W CC	1066-4325	ALLEN BRADLEY	CB 4325
R 14	RES-1K 5% 1/4W CC	1066-1025	ALLEN BRADLEY	CB1025
R 15	RES-8.25K 1% 100PPM FILM	1075-0014	CAT.LIST	55-100
R 16	RES-12.1K 1% 100PPM FILM	1075-0011	CAT.LIST	55-100
R 17	RES-4.99K 1% 100PPM FILM	1075-0095	CAT.LIST	55-100
R 18	RES-10K 1% 100PPM FILM	1075-0009	CAT.LIST	55-100
R 19	RES-14.3K 1% 100PPM FILM	1074-0113	CAT.LIST	55-100
R 20	RES-10K 1% 100PPM FILM	1075-0009	CAT.LIST	55-100
R 21	RES-160K 5% 1/4W CC	1066-1645	ALLEN BRADLEY	CB1645
R 22	RES-150 OHM 1% 100PPM FILM	1075-0125	CAT. LIST	55-100
R 23	RES-10K 1% 100PPM FILM	1075-0009	CAT.LIST	55-100
R 24	RES-5.1K 5% 1/4W CC	1066-5125	ALLEN BRADLEY	CB 5125
R 25	RES-1MEG 5% 1/4W CC	1066-1055	OHMITE	G.H. ONLY
R 26	RES-10K 5% 1/4W CC	1066-1035	ALLEN BRADLEY	CB1035
R 27	RES-4.7K 5% 1/4W CC	1066-4725	ALLEN BRADLEY	CB 4725
R 28	RES-100 OHM 5% 1/4W CC	1066-1015	ALLEN BRADLEY	CB1015
R 29	RES-10K 1% 100PPM FILM	1075-0009	CAT.LIST	55-100
R 30	RES-13K 1% 100PPM FILM	1075-0128	CAT. LIST	55-100
R 31	RES-2K 5% 1/4W CC	1066-2025	ALLEN BRADLEY	CB2025
R 32	RES-2.2MEG 5% 1/4W CC	1066-2255	ALLEN BRADLEY	CB2255

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
R 33	RES-390K 5% 1/4W CC	1066-3945	ALLEN BRADLEY	CB 3945
R 34	RES-8.2K 5% 1/4W CC	1066-8225	ALLEN BRADLEY	CB 8225
R 35	RES-1K 5% 1/4W CC	1066-1025	ALLEN BRADLEY	CB1025
R 36	RES-5.1K 5% 1/4W CC	1066-5125	ALLEN BRADLEY	CB 5125
R 37	RES-5.1K 5% 1/4W CC	1066-5125	ALLEN BRADLEY	CB 5125
R 38	RES-8.2K 5% 1/4W CC	1066-8225	ALLEN BRADLEY	CB 8225
R 39	RES-300 OHM 5% 1/4W CC	1066-3015	ALLEN BRADLEY	CB3015
R 40	RES-300 OHM 5% 1/4W CC	1066-3015	ALLEN BRADLEY	CB3015
R 41	RES-100K 5% 1/4W CC	1066-1045	ALLEN BRADLEY	CB1045
R 42	POT-20K 20% 1/2W 1T CERMET TRMR	1215-0044	BECKMAN	91AR20K
R 43	RES-390 OHM 5% 1/4W CC	1066-3915	ALLEN BRADLEY	CB 3915
R 44	POT-500 OHM 20% 1/4W 1T CC TRMR	1215-0026	CTS	X201R501B
R 45	RES-4.7K 5% 1/4W CC	1066-4725	ALLEN BRADLEY	CB 4725
R 46	RES-10 OHM 5% 1/2W CC	1067-1005	ALLEN BRADLEY	EB 1005
R 47	RES-680 OHM 5% 1/4W CC	1066-6815	ALLEN BRADLEY	CB 6815
R 48	RES-2.2K 5% 1/4W CC	1066-2225	ALLEN BRADLEY	CB2225
R 49	RES-20K 1% 100PPM FILM	1075-0096	CAT.LIST	55-100
R 50	RES-1MEG 5% 1/4W CC	1066-1055	OHMITE	G.H. ONLY
R 51	RES-300 OHM 5% 1/4W CC	1066-3015	ALLEN BRADLEY	CB3015
R 52	RES-100 OHM 5% 1/4W CC	1066-1015	ALLEN BRADLEY	CB1015
R 53	RES-10K 5% 1/4W CC	1066-1035	ALLEN BRADLEY	CB1035
R 54	RES-24.3K 1% 100PPM FILM	1075-0097	CAT.LIST	55-100
R 55	RES-75K 1% 100PPM FILM	1075-0135	CAT. LIST	55-100
R 56	RES-1K 5% 1/4W CC	1066-1025	ALLEN BRADLEY	CB1025
R 57	RES-3.3 OHM 5% 1/4W CC	1066-0006	ALLEN BRADLEY	CB33G5
R 58	RES-22.1K 1% 100PPM FILM	1075-0012	CAT.LIST	55-100
R 59	POT-10K 10% 3/4W 15T CERMET TRMR	1215-0014	HELITRIM	89WR10K
R 60	RES-47.5K 1% 100PPM FILM	1075-0076	CAT.LIST	55-100
R 62	RES-10 OHM 5% 1/2W CC	1067-1005	ALLEN BRADLEY	EB 1005
R 63	RES-100 OHM 5% 1/4W CC	1066-1015	ALLEN BRADLEY	CB1015
	INTEGRATED CIRCUIT			
U 1	IC-LM301A OP AMP	2025-0032	NATIONAL	LM301AH
U 2	IC-LM301A OP AMP	2025-0032	NATIONAL	LM301AH
U 3	IC-380 8 PIN DIP 2.5W AUDIO AMPL	2025-0256	NATIONAL	LM380N-8
U 4	IC-UA741CP	2025-0067	TI	UA741CP
U 5	IC-UA741CP	2025-0067	TI	UA741CP
U 6	IC-SN74LS00N TTL NAND GATES	2025-0114	TI	SN74LS00N
U 7	IC-SN74LS73N DUAL J-K FLIP FLOP	2025-0110	TI	SN74LS73N
U 8	IC-LM308N OP AMPL 8 PIN	2025-0070	NATIONAL	LM308N
U 9	IC-LM301A OP AMP	2025-0032	NATIONAL	LM301AH



1. FACTORY SELECT VALUE.



NOTE:

1. RESISTORS - 1/4W, 5% VALUES IN OHMS UNLESS OTHERWISE NOTED.
2. CAPACITORS - VALUES IN μF UNLESS OTHERWISE NOTED.
3. INDUCTORS - VALUES IN μH UNLESS OTHERWISE NOTED.
4. *FACTORY SELECT. TYPICAL VALUE SHOWN.
5. ALL VOLTAGES ARE DC UNLESS OTHERWISE NOTED.

IC NO	TYPE
6	SN74L00N
4, 5	SN7274IN
1, 2, 9	LM301A
3	MC3360P
7	SN74L73N
8	LM308N

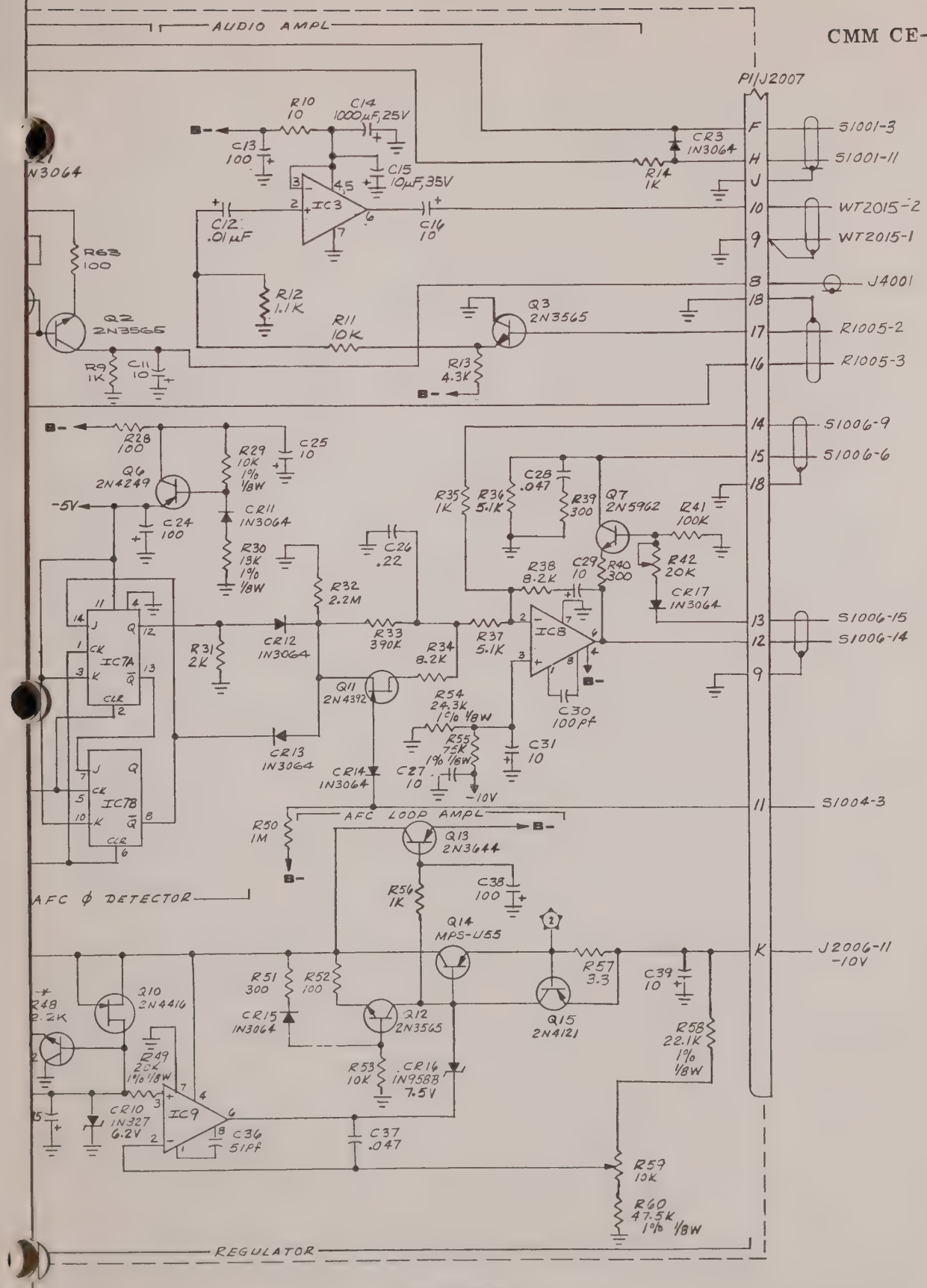
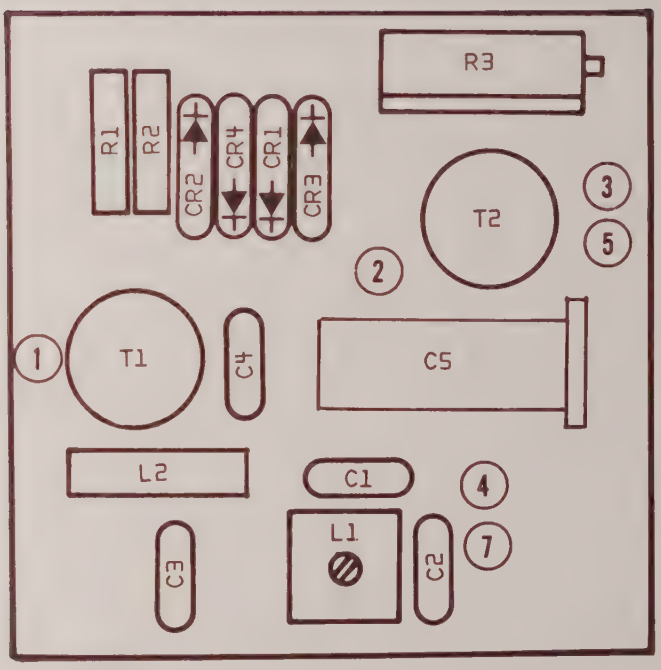


Figure 3-9. Audio/Meter Amplifier 2600

FIRST MIXER. 2700

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
2700	First Mixer	7001-0256	Cushman	
	P. C. Board	1780-0484	Cushman	
	CAPACITORS			
C1	Mica, 56pF, ±5%, 500V	1002-0019	Elmenco	DM15-E-560J
C2	Mica, 150pF, ±5%, 500V	1002-0021	Elmenco	DM15-F-151J
C3	Mica, 250pF, ±5%, 500V	1002-0061	Elmenco	DM15-F-251J
C4	Mica, 5pF, ±.5pF, 500V	1002-0028	Elmenco	DM15-C-050D
C5	Trim, .8-12pF, 750V	1001-0007	JFD	VC-316WY
	DIODES			
CR1	Hot Carrier, HPA2800	1283-0001	HPA	5082-2800
CR2	Hot Carrier, HPA2800	1283-0001	HPA	5082-2800
CR3	Hot Carrier, HPA2800	1283-0001	HPA	5082-2800
CR4	Hot Carrier, HPA2800	1283-0001	HPA	5082-2800
	INDUCTORS			
L1	Variable	1596-0081	Cushman	
L2	RF, Choke, .47μH, ±20%	1585-0031	Delevan	1537-06
	RESISTORS			
R1	MF, 51.1Ω, ±1%, 150PPM, 1/8W	1075-0077	Dale	MFF 1/8 T-0
R2	MF, 51.1Ω, ±1%, 150PPM, 1/8W	1075-0077	Dale	MFF 1/8 T-0
R3	Pot, 100Ω, ±10%, 3/4W	1215-0010	Helitrim	89WR
	TRANSFORMERS			
T1	Toroid, Trifilar	1579-0017	Cushman	
T2	Toroid, Trifilar	1579-0017	Cushman	

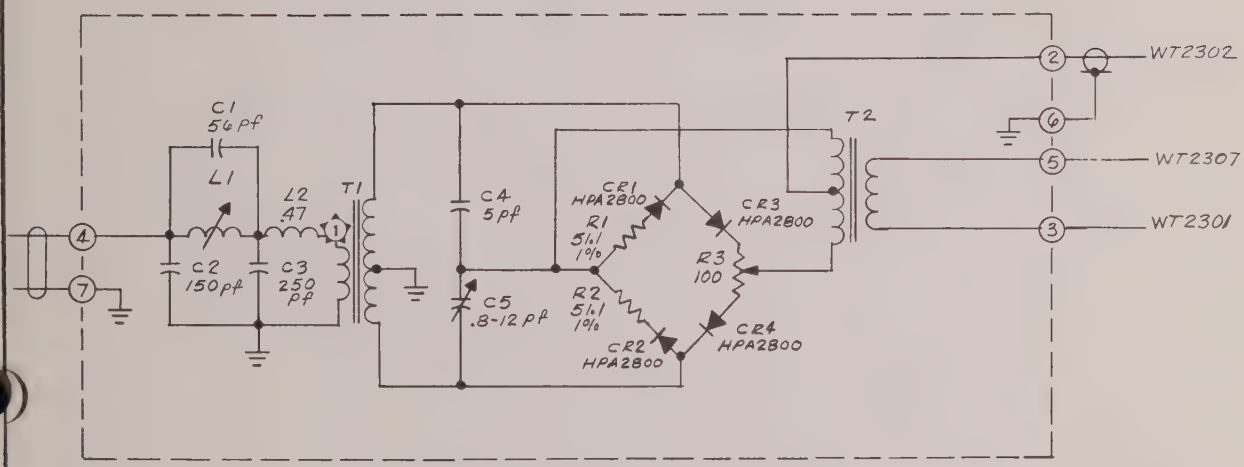


WT2107

WT2108

NOTE:

1. RESISTORS
2. CAPACITOR
3. INDUCTORS
4. *FACTORY
5. ALL VOLTA

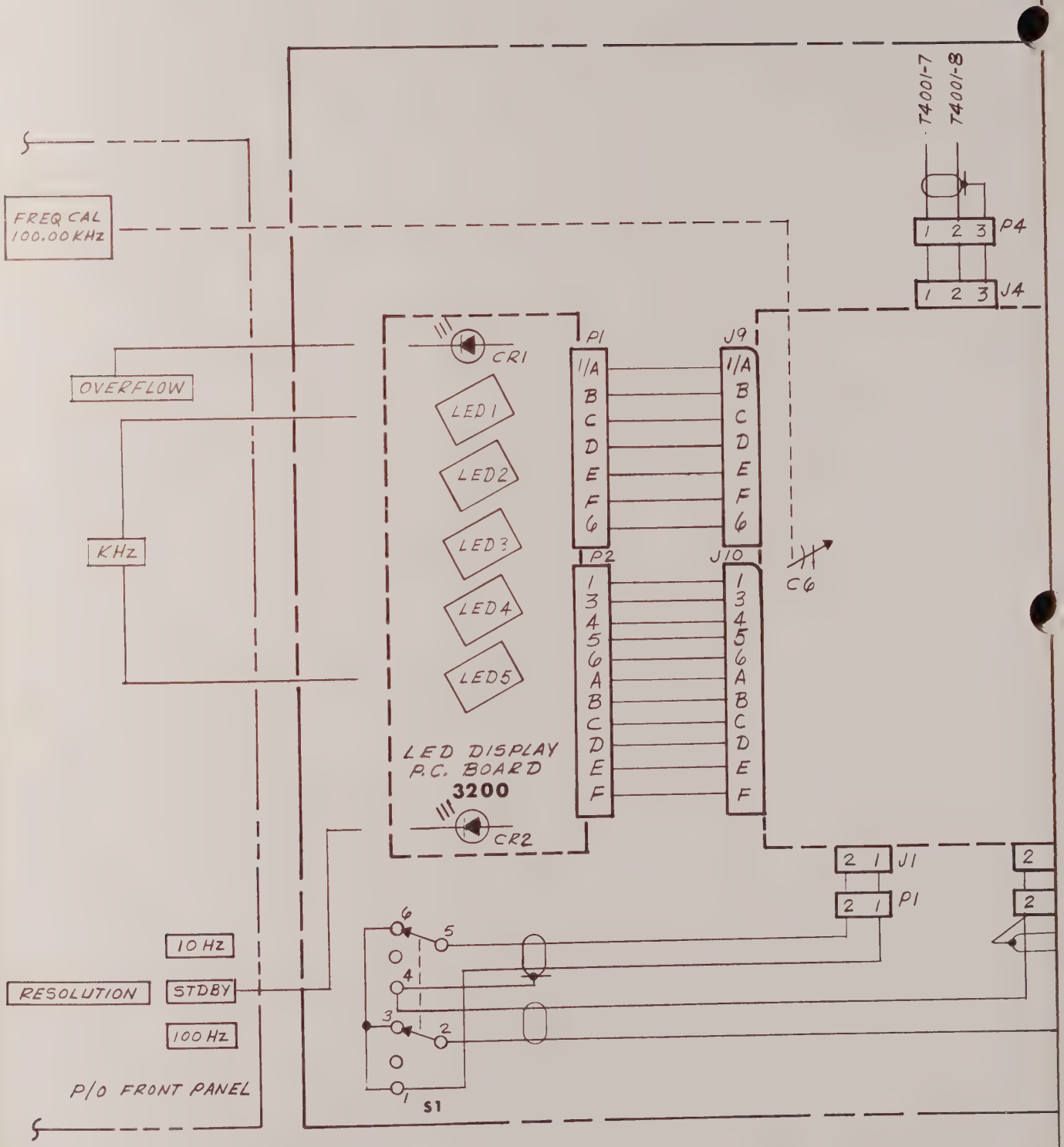


- 1/4W, 5% VALUES IN OHMS UNLESS OTHERWISE NOTED.
- VALUES IN μF UNLESS OTHERWISE NOTED.
- VALUES IN μH UNLESS OTHERWISE NOTED.
SELECT. TYPICAL VALUE SHOWN.
GES ARE DC UNLESS OTHERWISE NOTED.

Figure 3-10. First Mixer. 2700

LOGIC/DISPLAY CONTAINER ASSEMBLY. 3000

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
3000	Logic/Display Container Assembly	7046-0022	Cushman	
	CONNECTORS			
P1	2 pin Plug, Non-locking, Mini	2535-0060	Molex	09-50-7021
P2	3 pin Plug, Non-locking, Mini	2535-0059	Molex	09-50-7031
P3	3 pin Plug, Non-locking, Mini	2535-0059	Molex	09-50-7031
P4	3 pin Plug, Non-locking, Mini	2535-0059	Molex	09-50-7031
P5	2 pin Plug, Non-locking, Mini	2535-0060	Molex	09-50-7021
P6	2 pin Plug, Non-locking, Mini	2535-0060	Molex	09-50-7021
P7	3 pin Plug, Non-locking, Mini	2535-0059	Molex	09-50-7031
P8	3 pin Plug, Non-locking, Mini	2535-0059	Molex	09-50-7031
	Pins, Mini female, for P1-P8	4153-0007	Molex	2578-TL
	Pins, square female, on wire	4153-0011	Malco	122-0192-019
	TRANSISTORS			
Q1	Ge, PNP, 2N1544	1272-0096	Motorola	2N1544
Q2	Si, NPN, 2N3054	1271-0001	RCA	2N3054
	SWITCH			
S1	DPDT, Flat Handle, Toggle	1850-0018	C&K	7203PY1ZQE


T4001-7
T4001-8
P4
J4
FREQ CAL
100.00KHz
OVERFLOW
KHz
CR1
LED1
LED2
LED3
LED4
LED5
P1
J9
P2
J10
C6
LED DISPLAY
P.C. BOARD
3200
CR2
J1
P1
10 Hz
RESOLUTION
STDBY
100 Hz
P/O FRONT PANEL
S1

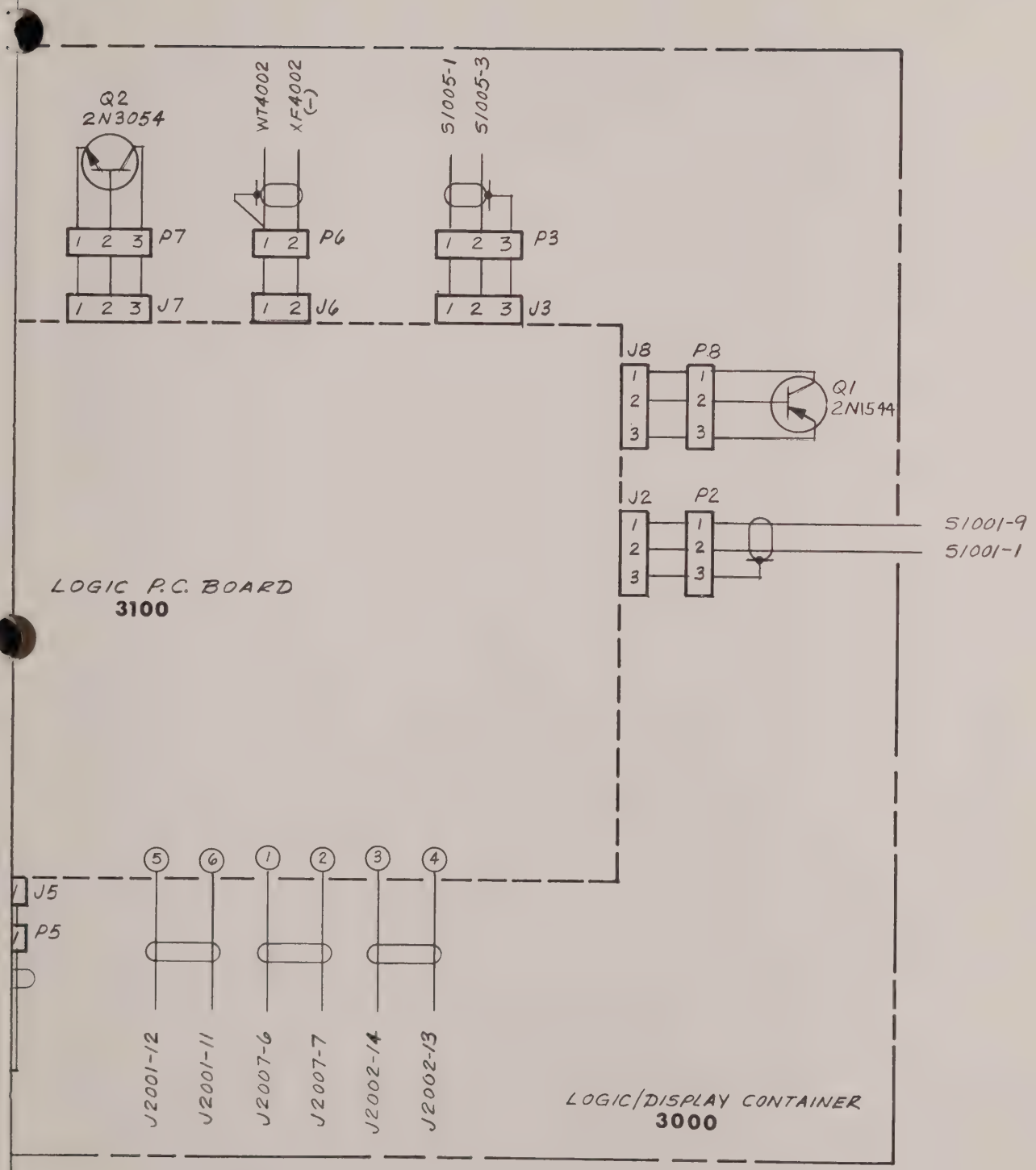


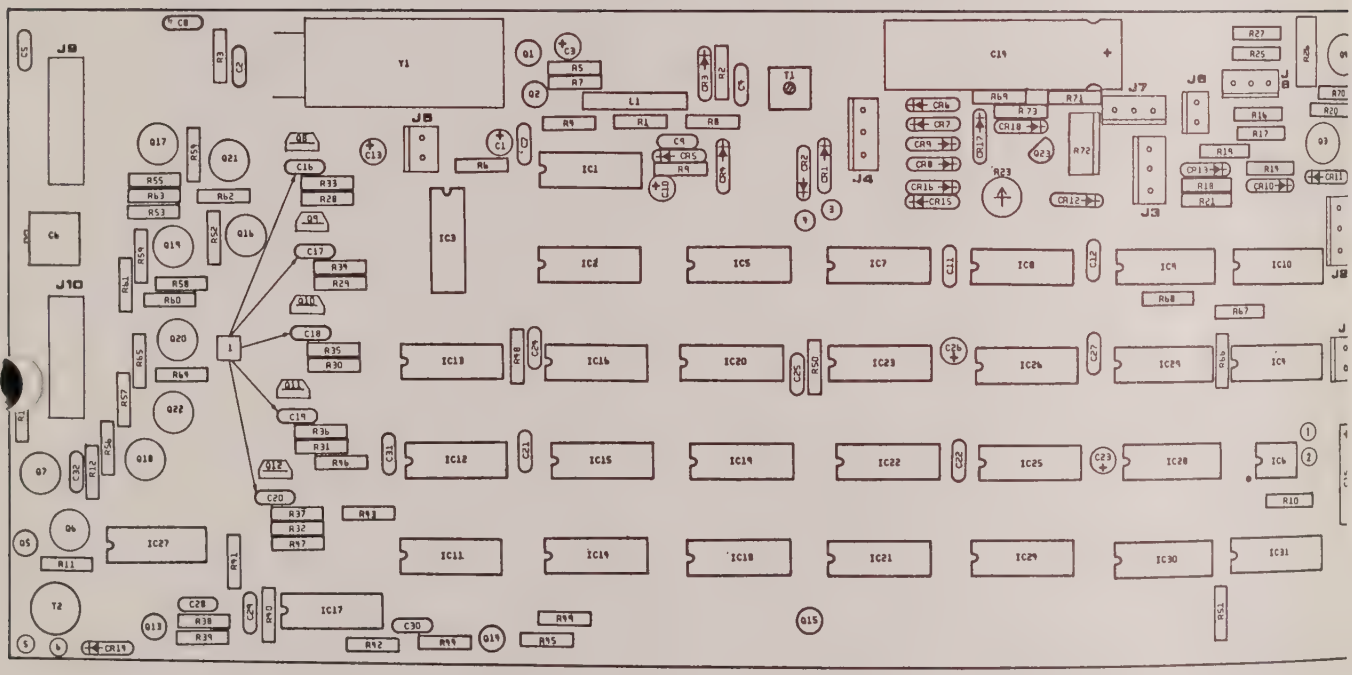
Figure 3-11. Logic Container Interconnection Diagram. 3000

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
[illegible]00	PCB ASSY - LOGIC	7001-0452	CUSHMAN	CE-24A
	PRINTED CIRCUIT BOARD	1780-0515	CUSHMAN	
	CAPACITOR			
C 1	CAP-10UF 20% 35V RDL TANT	1011-0006	MATSUO	221L3502106M3
C 2	CAP-1000PF 5% 100V DIP MICA	1002-0015	ELMENCO	DM15-F-102J
C 3	CAP-10UF 20% 35V RDL TANT	1011-0006	MATSUO	221L3502106M3
C 4	CAP-1000PF 5% 100V DIP MICA	1002-0015	ELMENCO	DM15-F-102J
C 5	CAP-15PF 10% 500V P100 CER DISC	1005-0103	RMC	CGP100
C 6	CAP-2-8PF 350V NPO H MT CER TRMR	1001-0010	ERIE	538-006A (2-8)
C 7	CAP-.01UF +80-20% 25V Y5U CER DISC	1005-0013	ERIE	5835-512-Y5U-103Z
C 8	CAP-56PF 5% 500V DIP MICA	1002-0019	ELMENCO	DM15-E-560J
C 9	CAP-.1UF 20% 50V Z5U CER DISC	1005-0044	SPRAGUE	5CZ5U104X0050C5
C 10	CAP-1UF 20% 50V RDL TANT	1011-0013	KEMET	T368A105M050AS
C 11	CAP-.05UF +80-20% 25V Y5U CER DISC	1005-0014	ERIE	5835-514-Y5U-503Z
C 12	CAP-.05UF +80-20% 25V Y5U CER DISC	1005-0014	ERIE	5835-514-Y5U-503Z
C 13	CAP-100UF 20% 20V RDL TANT	1011-0010	KEMET	T362D107M020AS
C 14	CAP-1000UF +50-10% 25V ELCTLT	1014-0006	ILLINOIS	108TTA025A
C 15	CAP-100UF +75-10% 16V AXL ELCTLT	1013-0011	NICHICON	16ELA100
C 21	CAP-.05UF +80-20% 25V Y5U CER DISC	1005-0014	ERIE	5835-514-Y5U-503Z
C 22	CAP-.05UF +80-20% 25V Y5U CER DISC	1005-0014	ERIE	5835-514-Y5U-503Z
C 23	CAP-10UF 20% 35V RDL TANT	1011-0006	MATSUO	221L3502106M3
C 24	CAP-.05UF +80-20% 25V Y5U CER DISC	1005-0014	ERIE	5835-514-Y5U-503Z
C 25	CAP-.05UF +80-20% 25V Y5U CER DISC	1005-0014	ERIE	5835-514-Y5U-503Z
C 26	CAP-10UF 20% 35V RDL TANT	1011-0006	MATSUO	221L3502106M3
C 27	CAP-.05UF +80-20% 25V Y5U CER DISC	1005-0014	ERIE	5835-514-Y5U-503Z
C 28	CAP-.01UF +80-20% 25V Y5U CER DISC	1005-0013	ERIE	5835-512-Y5U-103Z
C 29	CAP-680PF 5% 300V DIP MICA	1002-0022	ELMENCO	DM15-F-681J
[illegible]30	CAP-.0039UF GMV 1KV Z5U CER DISC	1005-0106	SPRAGUE	5HK-D39
[illegible]31	CAP-330PF 5% 500V DIP MICA	1002-0032	ELMENCO	DM15-F-331J
C 32	CAP-.05UF +80-20% 25V Y5U CER DISC	1005-0014	ERIE	5835-514-Y5U-503Z
	DIODE			
CR 1	DIO-1N3064 SI SW D07/D035 75PRV .25W	1281-0013	FAIRCHILD	1N3064
CR 2	DIO-1N3064 SI SW D07/D035 75PRV .25W	1281-0013	FAIRCHILD	1N3064
CR 3	DIO-1N3064 SI SW D07/D035 75PRV .25W	1281-0013	FAIRCHILD	1N3064
CR 4	DIO-G633 GE SIG D07 1.5PF 40PRV	1282-0005	ITT	C/E DWG G633
CR 5	DIO-G633 GE SIG D07 1.5PF 40PRV	1282-0005	ITT	C/E DWG G633
CR 6	DIO-1N4002 SI RECT A23F 100PRV 1A	1281-0023	ITT	1N4002
CR 7	DIO-1N4002 SI RECT A23F 100PRV 1A	1281-0023	ITT	1N4002
CR 8	DIO-1N4002 SI RECT A23F 100PRV 1A	1281-0023	ITT	1N4002
CR 9	DIO-1N4002 SI RECT A23F 100PRV 1A	1281-0023	ITT	1N4002
CR 10	DIO-1N3064 SI SW D07/D035 75PRV .25W	1281-0013	FAIRCHILD	1N3064
CR 11	DIO-1N749A SI ZENER D07 4.3V 5% .4W	1281-0034	MOTOROLA	1N749A
CR 12	DIO-1N958B SI ZENER D07 7.5V 5% .4W	1281-0071	MOTOROLA	1N958B
CR 13	DIO-1N3064 SI SW D07/D035 75PRV .25W	1281-0013	FAIRCHILD	1N3064
CR 14	DIO-1N3064 SI SW D07/D035 75PRV .25W	1281-0013	FAIRCHILD	1N3064
CR 15	DIO-1N3064 SI SW D07/D035 75PRV .25W	1281-0013	FAIRCHILD	1N3064
CR 16	DIO-1N3064 SI SW D07/D035 75PRV .25W	1281-0013	FAIRCHILD	1N3064
CR 17	DIO-1N3064 SI SW D07/D035 75PRV .25W	1281-0013	FAIRCHILD	1N3064
CR 18	DIO-1N3064 SI SW D07/D035 75PRV .25W	1281-0013	FAIRCHILD	1N3064
	CONNECTOR			
J 1	CONN-2 PIN RECEPT.	2535-0061	MOLEX	09-60-1021
J 2	CONN-3 PIN RECEPT.	2535-0062	MOLEX	09-60-1031
J 3	CONN-3 PIN RECEPT.	2535-0062	MOLEX	09-60-1031
[illegible]4	CONN-3 PIN RECEPT.	2535-0062	MOLEX	09-60-1031

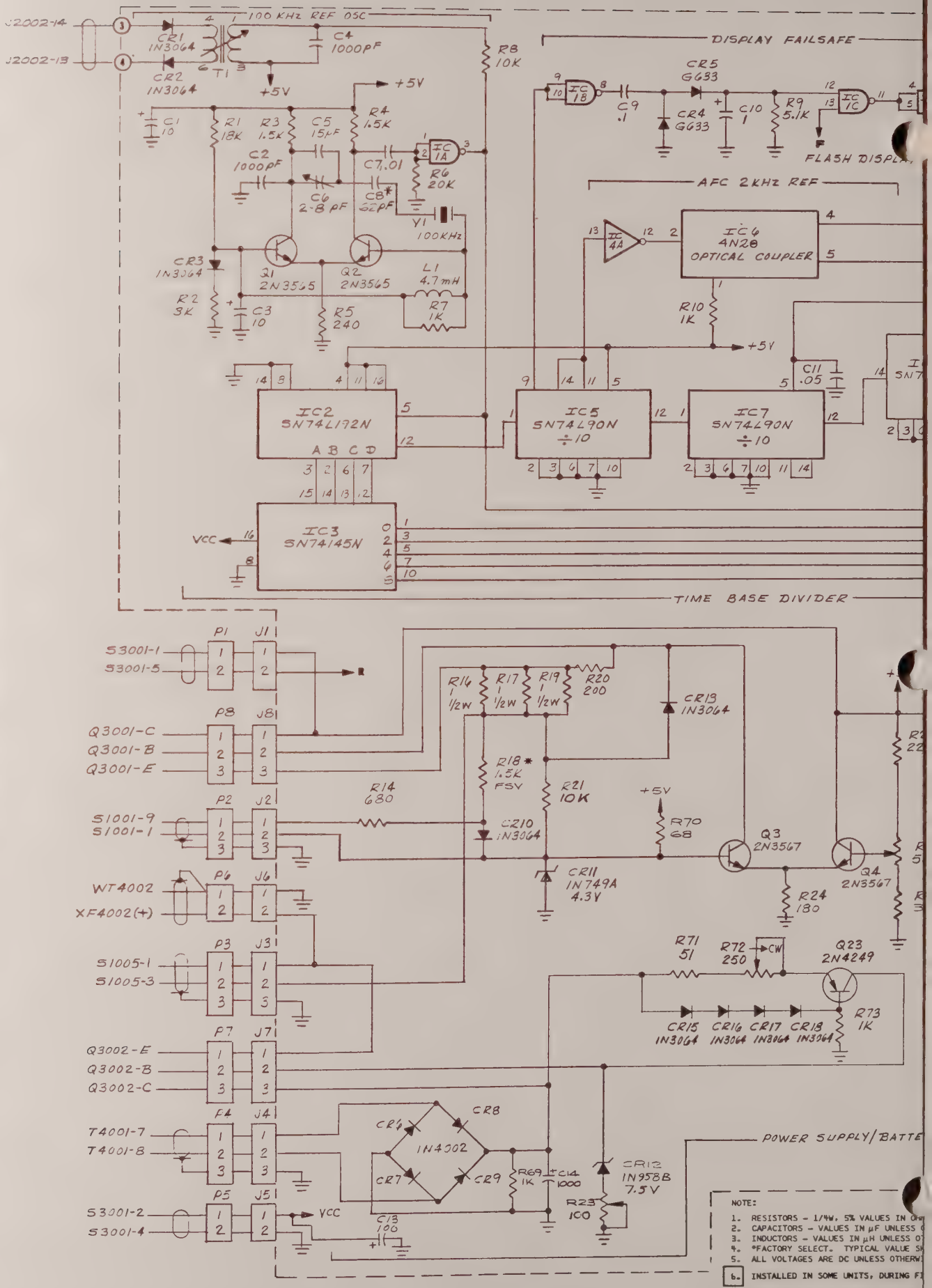
CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
J 5	CONN-2 PIN RECEPT.	2535-0061	MOLEX	09-60-1021
J 6	CONN-2 PIN RECEPT.	2535-0061	MOLEX	09-60-1021
J 7	CONN-3 PIN RECEPT.	2535-0062	MOLEX	09-60-1031
J 8	CONN-3 PIN RECEPT.	2535-0062	MOLEX	09-60-1031
J 9	CONN-12 CONTACT DOUBLE ROW	2535-0063	VIKING	2VK6D/2-12
J 10	CONN-12 CONTACT DOUBLE ROW	2535-0063	VIKING	2VK6D/2-12
	INDUCTOR			
L 1	CH-4700UH 5% RF MLD AXL .19DX.44L	1585-0006	DELEVAN	2500-60
	TRANSISTOR			
Q 1	XSTR-2N3565 NPN SI R110 LOW PWR	1272-0017	FAIRCHILD	2N3565
Q 2	XSTR-2N3565 NPN SI R110 LOW PWR	1272-0017	FAIRCHILD	2N3565
Q 3	XSTR-2N3567 NPN SI TO 105 LOW PWR	1272-0014		
Q 4	XSTR-2N3567 NPN SI TO 105 LOW PWR	1272-0014		
Q 5	XSTR-2N4275 NPN SI R110 LOW PWR/SW	1272-0016	FAIRCHILD	2N4275
Q 6	XSTR-2N3644 PNP SI R110A LOW PWR/SW	1272-0040	FAIRCHILD	2N3644
Q 7	XSTR-2N3644 PNP SI R110A LOW PWR/SW	1272-0040	FAIRCHILD	2N3644
Q 8	XSTR-MPS-U55 PNP SI B18 HIGH PWR	1272-0074		
Q 9	XSTR-MPS-U55 PNP SI B18 HIGH PWR	1272-0074		
Q 10	XSTR-MPS-U55 PNP SI B18 HIGH PWR	1272-0074		
Q 11	XSTR-MPS-U55 PNP SI B18 HIGH PWR	1272-0074		
Q 12	XSTR-MPS-U55 PNP SI B18 HIGH PWR	1272-0074		
Q 13	XSTR-2N4275 NPN SI R110 LOW PWR/SW	1272-0016	FAIRCHILD	2N4275
Q 14	XSTR-2N4275 NPN SI R110 LOW PWR/SW	1272-0016	FAIRCHILD	2N4275
Q 15	XSTR-2N4275 NPN SI R110 LOW PWR/SW	1272-0016	FAIRCHILD	2N4275
Q 16	XSTR-2N3644 PNP SI R110A LOW PWR/SW	1272-0040	FAIRCHILD	2N3644
Q 17	XSTR-2N3644 PNP SI R110A LOW PWR/SW	1272-0040	FAIRCHILD	2N3644
Q 18	XSTR-2N3644 PNP SI R110A LOW PWR/SW	1272-0040	FAIRCHILD	2N3644
Q 19	XSTR-2N3644 PNP SI R110A LOW PWR/SW	1272-0040	FAIRCHILD	2N3644
Q 20	XSTR-2N3644 PNP SI R110A LOW PWR/SW	1272-0040	FAIRCHILD	2N3644
Q 21	XSTR-2N3644 PNP SI R110A LOW PWR/SW	1272-0040	FAIRCHILD	2N3644
Q 22	XSTR-2N3644 PNP SI R110A LOW PWR/SW	1272-0040	FAIRCHILD	2N3644
Q 23	XSTR-2N4249 PNP SI R124B LOW PWR	1272-0024	CARTER SEMI	2N4249
	RESISTOR			
R 1	RES-18K 5% 1/4W CC	1066-1835	ALLEN BRADLEY	CB1835
R 2	RES-3K 5% 1/4W CC	1066-3025	ALLEN BRADLEY	CB3025
R 3	RES-1.5K 5% 1/4W CC	1066-1525	ALLEN BRADLEY	CB1525
P 4	RES-1.5K 5% 1/4W CC	1066-1525	ALLEN BRADLEY	CB1525
R 5	RES-240 OHM 5% 1/4W CC	1066-2415	ALLEN BRADLEY	CB2415
R 6	RES-20K 5% 1/4W CC	1066-2035	ALLEN BRADLEY	CB2035
R 7	RES-1K 5% 1/4W CC	1066-1025	ALLEN BRADLEY	CB1025
R 8	RES-10K 5% 1/4W CC	1066-1035	ALLEN BRADLEY	CB1035
R 9	RES-5.1K 5% 1/4W CC	1066-5125	ALLEN BRADLEY	CB 5125
R 10	RES-1K 5% 1/4W CC	1066-1025	ALLEN BRADLEY	CB1025
R 11	RES-5.1K 5% 1/4W CC	1066-5125	ALLEN BRADLEY	CB 5125
R 12	RES-91 OHM 5% 1/4W CC	1066-9105	ALLEN BRADLEY	CB 9105
R 13	RES-91 OHM 5% 1/4W CC	1066-9105	ALLEN BRADLEY	CB 9105
R 14	RES-680 OHM 5% 1/4W CC	1066-6815	ALLEN BRADLEY	CB 6815
R 16	RES-1 OHM 5% 1/2W CC	1067-0001	ALLEN BRADLEY	EB 0001
R 17	RES-1 OHM 5% 1/2W CC	1067-0001	ALLEN BRADLEY	EB 0001
R 18	RES-1K 5% 1/4W CC	1066-1025	ALLEN BRADLEY	CB1025
R 19	RES-1 OHM 5% 1/2W CC	1067-0001	ALLEN BRADLEY	EB 0001
R 20	RES-200 OHM 5% 1/4W CC	1066-2015	ALLEN BRADLEY	CB2015
R 21	RES-10K 5% 1/4W CC	1066-1035	ALLEN BRADLEY	CB1035

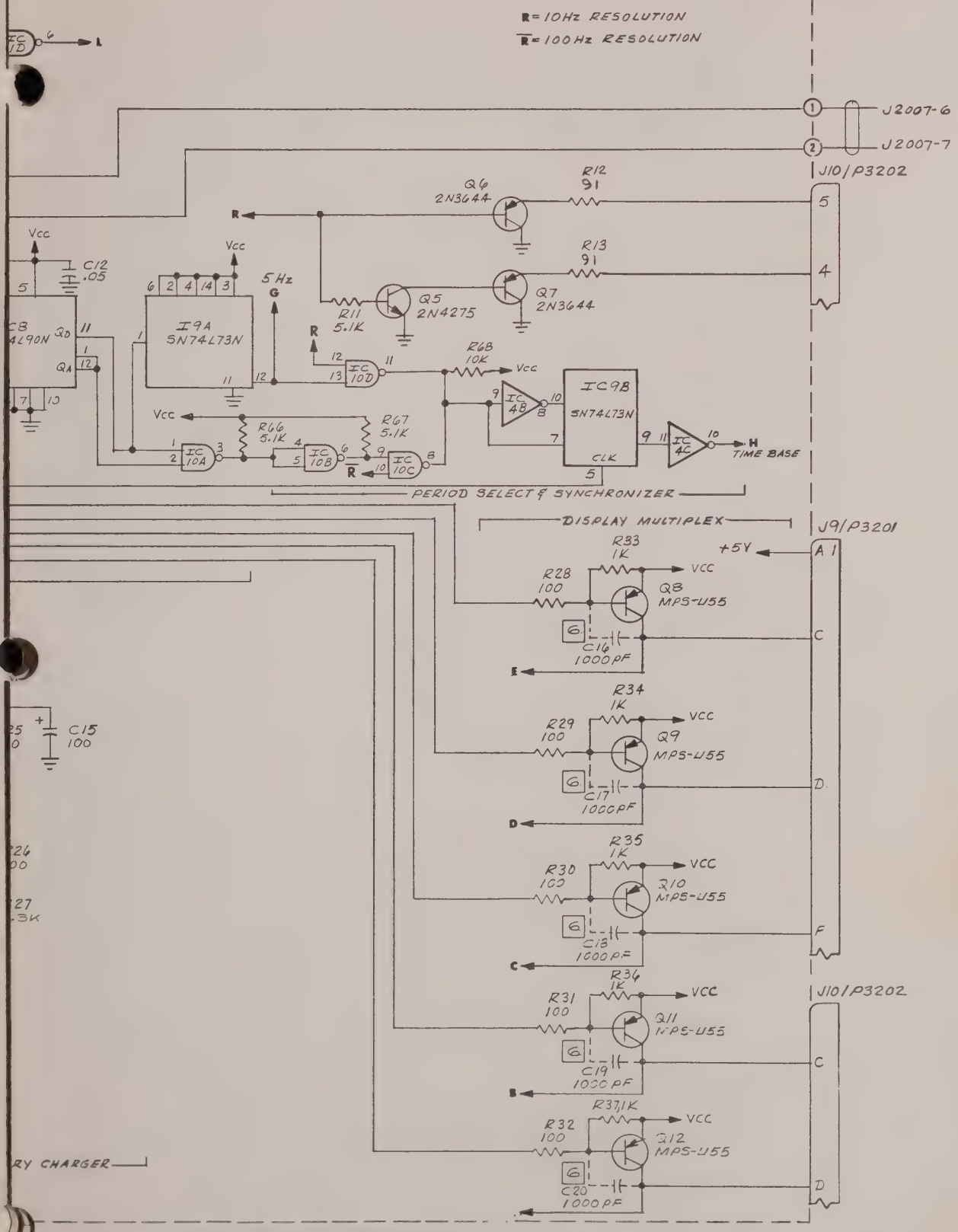
CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
R 23	POT-100 OHM 20% 1/2W 1T CERMET TRMR	1215-0054	BECKMAN	91AR100
R 24	RES-180 OHM 5% 1/4W CC	1066-1815	ALLEN BRADLEY	CB1815
R 25	RES-220 OHM 5% 1/4W CC	1066-2215	ALLEN BRADLEY	CB2215
R 26	POT-500 OHM 20% 1/4W 1T CC TRMR	1215-0026	CTS	X201R501B
R 27	RES-3.3K 5% 1/4W CC	1066-3325	ALLEN BRADLEY	CB3325
R 28	RES-100 OHM 5% 1/4W CC	1066-1015	ALLEN BRADLEY	CB1015
R 29	RES-100 OHM 5% 1/4W CC	1066-1015	ALLEN BRADLEY	CB1015
R 30	RES-100 OHM 5% 1/4W CC	1066-1015	ALLEN BRADLEY	CB1015
R 31	RES-100 OHM 5% 1/4W CC	1066-1015	ALLEN BRADLEY	CB1015
R 32	RES-100 OHM 5% 1/4W CC	1066-1015	ALLEN BRADLEY	CB1015
R 33	RES-1K 5% 1/4W CC	1066-1025	ALLEN BRADLEY	CB1025
R 34	RES-1K 5% 1/4W CC	1066-1025	ALLEN BRADLEY	CB1025
R 35	RES-1K 5% 1/4W CC	1066-1025	ALLEN BRADLEY	CB1025
R 36	RES-1K 5% 1/4W CC	1066-1025	ALLEN BRADLEY	CB1025
R 37	RES-1K 5% 1/4W CC	1066-1025	ALLEN BRADLEY	CB1025
R 38	RES-15K 5% 1/4W CC	1066-1535	ALLEN BRADLEY	CB1535
R 39	RES-1K 5% 1/4W CC	1066-1025	ALLEN BRADLEY	CB1025
R 40	RES-5.1K 5% 1/4W CC	1066-5125	ALLEN BRADLEY	CB 5125
R 41	RES-5.1K 5% 1/4W CC	1066-5125	ALLEN BRADLEY	CB 5125
R 42	RES-470 OHM 5% 1/4W CC	1066-4715	ALLEN BRADLEY	CB 4715
R 43	RES-2.4K 5% 1/4W CC	1066-2425	ALLEN BRADLEY	CB2425
R 44	RES-2.4K 5% 1/4W CC	1066-2425	ALLEN BRADLEY	CB2425
R 45	RES-2K 5% 1/4W CC	1066-2025	ALLEN BRADLEY	CB2025
R 46	RES-5.1K 5% 1/4W CC	1066-5125	ALLEN BRADLEY	CB 5125
R 47	RES-5.1K 5% 1/4W CC	1066-5125	ALLEN BRADLEY	CB 5125
R 48	RES-2.4K 5% 1/4W CC	1066-2425	ALLEN BRADLEY	CB2425
R 49	RES-2.4K 5% 1/4W CC	1066-2425	ALLEN BRADLEY	CB2425
R 50	RES-2K 5% 1/4W CC	1066-2025	ALLEN BRADLEY	CB2025
R 51	RES-240 OHM 5% 1/4W CC	1066-2415	ALLEN BRADLEY	CB2415
R 52	RES-300 OHM 5% 1/4W CC	1066-3015	ALLEN BRADLEY	CB3015
R 53	RES-75 OHM 5% 1/4W CC	1066-7505	ALLEN BRADLEY	CB 7505
R 54	RES-300 OHM 5% 1/4W CC	1066-3015	ALLEN BRADLEY	CB3015
R 55	RES-75 OHM 5% 1/4W CC	1066-7505	ALLEN BRADLEY	CB 7505
R 56	RES-300 OHM 5% 1/4W CC	1066-3015	ALLEN BRADLEY	CB3015
R 57	RES-75 OHM 5% 1/4W CC	1066-7505	ALLEN BRADLEY	CB 7505
R 58	RES-300 OHM 5% 1/4W CC	1066-3015	ALLEN BRADLEY	CB3015
R 59	RES-75 OHM 5% 1/4W CC	1066-7505	ALLEN BRADLEY	CB 7505
R 60	RES-300 OHM 5% 1/4W CC	1066-3015	ALLEN BRADLEY	CB3015
R 61	RES-75 OHM 5% 1/4W CC	1066-7505	ALLEN BRADLEY	CB 7505
R 62	RES-300 OHM 5% 1/4W CC	1066-3015	ALLEN BRADLEY	CB3015
R 63	RES-75 OHM 5% 1/4W CC	1066-7505	ALLEN BRADLEY	CB 7505
R 64	RES-300 OHM 5% 1/4W CC	1066-3015	ALLEN BRADLEY	CB3015
R 65	RES-75 OHM 5% 1/4W CC	1066-7505	ALLEN BRADLEY	CB 7505
R 66	RES-5.1K 5% 1/4W CC	1066-5125	ALLEN BRADLEY	CB 5125
R 67	RES-5.1K 5% 1/4W CC	1066-5125	ALLEN BRADLEY	CB 5125
R 68	RES-10K 5% 1/4W CC	1066-1035	ALLEN BRADLEY	CB1035
R 69	RES-1K 5% 1/4W CC	1066-1025	ALLEN BRADLEY	CB1025
R 70	RES-68 OHM 5% 1/4W CC	1066-6805	ALLEN BRADLEY	CB 6805
R 71	RES-51 OHM 5% 1/4W CC	1066-5105	ALLEN BRADLEY	CB 5105
R 72	POT-250 OHM 20% 1/4W 1T CC TRMR	1215-0025	CTS	X201R251B
R 73	RES-1K 5% 1/4W CC	1066-1025	ALLEN BRADLEY	CB1025
	TRANSFORMER			
T 1	TRANSF-VARIABLE IF	1597-0002		
T 2	ASSY-TRIFILAR COIL	1579-0017		

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
	INTEGRATED CIRUIT			
U 1	IC-SN74LS00N TTL NAND GATES	2025-0114	TI	SN74LS00N
U 2	IC-74LS192 16 PIN DIP BCD-DEC UP/DWN	2025-0226	FAIRCHILD	74LS192PC
U 3	IC-SN74145N	2025-0074	TI	SN74145N
U 4	IC-SN7404N HEX INVERTER	2025-0048	TI	SN7404N
U 5	IC-SN74L90N DECADE COUNTER	2025-0071	NATIONAL	DM74LS90N
U 6	IC-4N28 OPTOELECTRONIC COUPLERS	2025-0073	MOTOROLA	4N28
U 7	IC-SN74L90N DECADE COUNTER	2025-0071	NATIONAL	DM74LS90N
U 8	IC-SN74L90N DECADE COUNTER	2025-0071	NATIONAL	DM74LS90N
U 9	IC-SN74LS73N DUAL J-K FLIP FLOP	2025-0110	TI	SN74LS73N
U 10	IC-SN74L03N	2025-0080	TI	SN74LS03N
U 11	IC-SN7400N TTL NAND GATES	2025-0003	TI	SN7400N
U 12	IC-SN74L75N	2025-0076	TI	SN74L75N
U 13	IC-SN74196N	2025-0016	FAIRCHILD	74196PC
U 14	IC-SN7400N TTL NAND GATES	2025-0003	TI	SN7400N
U 15	IC-SN74L75N	2025-0076	TI	SN74L75N
U 16	IC-SN7490N	2025-0002	TI	SN7490N
U 17	IC-SN7400N TTL NAND GATES	2025-0003	TI	SN7400N
U 18	IC-SN7400N TTL NAND GATES	2025-0003	TI	SN7400N
U 19	IC-SN74L75N	2025-0076	TI	SN74L75N
U 20	IC-SN7490N	2025-0002	TI	SN7490N
U 21	IC-SN7400N TTL NAND GATES	2025-0003	TI	SN7400N
U 22	IC-SN74L75N	2025-0076	TI	SN74L75N
U 23	IC-SN74196N	2025-0016	FAIRCHILD	74196PC
U 24	IC-SN7400N TTL NAND GATES	2025-0003	TI	SN7400N
U 25	IC-SN74L75N	2025-0076	TI	SN74L75N
U 26	IC-SN74196N	2025-0016	FAIRCHILD	74196PC
U 27	IC-74LS47 16PIN DIP BCD 7SEG DCDR/DRV	2025-0218	NATIONAL	DM74LS47N
U 28	IC-SN74L75N	2025-0076	TI	SN74L75N
U 29	IC-SN7490N	2025-0002	TI	SN7490N
U 30	IC-SN7427N TRIPLE 3-INPUT POS-NOR GAT	2025-0094	TEXAS INSTRUMENTS	SN7427N
U 31	IC-SN74LS00N TTL NAND GATES	2025-0114	TI	SN74LS00N
	CRYSTAL			
Y 1	XTAL-100 KHZ METAL	2035-0013	BULOVA	C/E DWG



1. INSTALLED IN CERTAIN UNITS DURING FINAL TEST.


100 KHz REF OSC
J2002-14
J2002-13
CR1 IN3064
CR2 IN3064
T1
C4 1000pF
+5V
R8 10K
C1 10
R1 18K
R3 1.5K
C5 15pF
R4 1.5K
C2 1000pF
C6 2-8 pF
C7 .01
C8* 62pF
IC 1A
R6 20K
Y1 100KHz
CR3 IN3064
Q1 2N3565
Q2 2N3565
L1 4.7mH
R7 1K
R2 3K
C3 10
R5 240
DISPLAY FAILSAFE
IC 1B
CR5 GG33
CR4 GG33
C9 .1
C10 1
R9 5.1K
IC 1C
FLASH DISPLAY
AFC 2KHz REF
IC 4A
IC6 4N28 OPTICAL COUPLER
R10 1K
C11 .05
IC2 SN74L172N
A B C D
IC5 SN74L90N ÷10
IC7 SN74L90N ÷10
IC3 SN74145N
VCC
TIME BASE DIVIDER
P1 J1
S3001-1
S3001-5
P8 J8
Q3001-C
Q3001-B
Q3001-E
P2 J2
S1001-9
S1001-1
P6 J6
WT4002
XF4002(+)
P3 J3
S1005-1
S1005-3
P7 J7
Q3002-E
Q3002-B
Q3002-C
P4 J4
T4001-7
T4001-8
P5 J5
S3001-2
S3001-4
R16 1 1/2W
R17 1 1/2W
R19 1 1/2W
R20 200
CR13 IN3064
R18* 1.5K FSV
R21 10K
R14 680
CR10 IN3064
CR11 IN749A 4.3V
R70 68
Q3 2N3567
Q4 2N3567
R24 180
R71 51
R72 250 CW
Q23 2N4249
CR15 IN3064
CR16 IN3064
CR17 IN3064
CR18 IN3064
R73 1K
CR6
CR8
IN4002
CR7
CR9
R69 1K
C14 1000
CR12 IN958B 7.5V
R23 100
C13 100
POWER SUPPLY/BATTE
NOTE:
1. RESISTORS - 1/4W, 5% VALUES IN
2. CAPACITORS - VALUES IN µF UNLESS
3. INDUCTORS - VALUES IN µH UNLESS O
4. *FACTORY SELECT. TYPICAL VALUE SH
5. ALL VOLTAGES ARE DC UNLESS OTHERW
6. INSTALLED IN SOME UNITS, DURING F

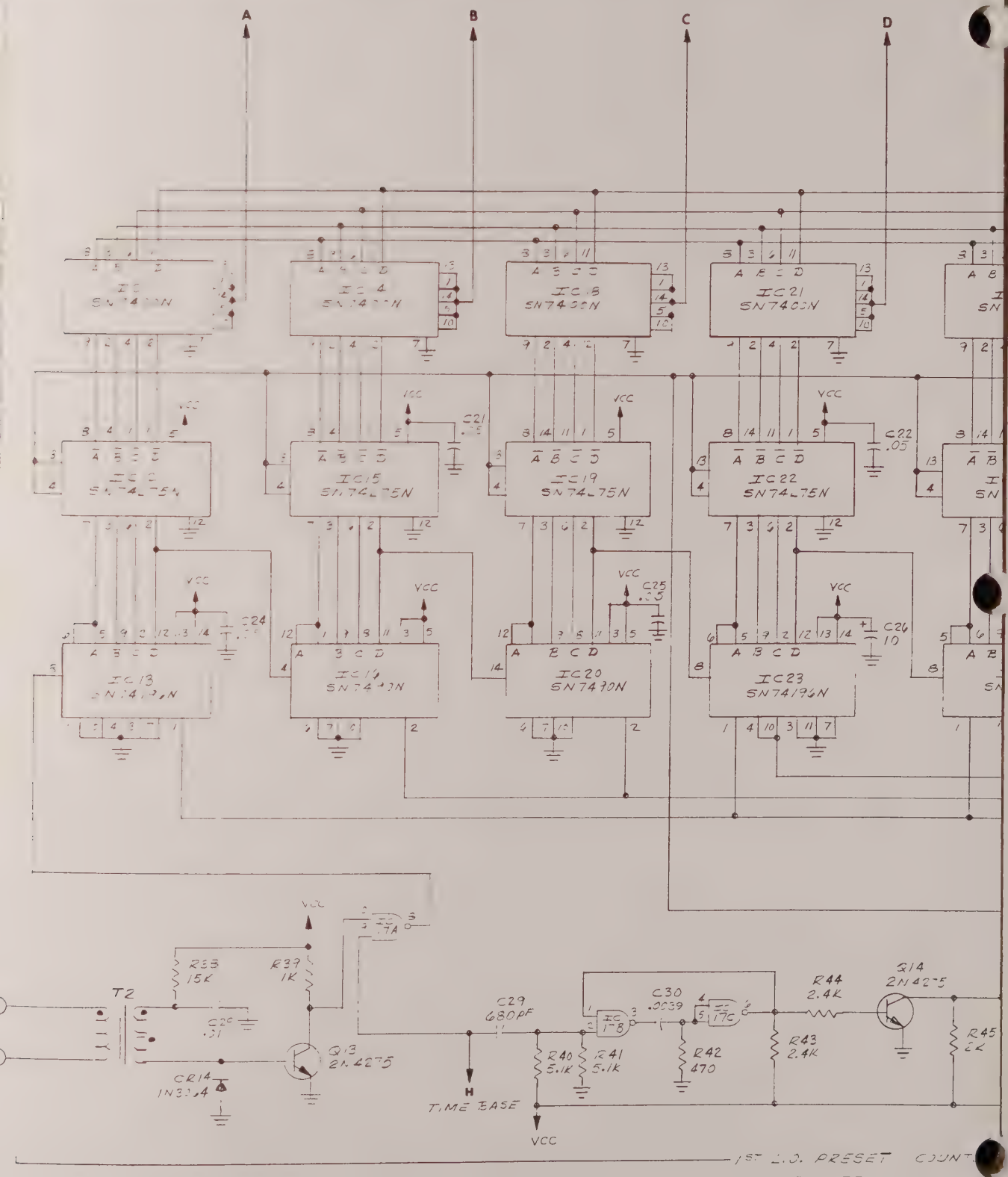


IC NOS	TYPE	TERM NO.	
		VCC	GND
1,31	SN74L00N	14	7
4	SN74L04N	14	7
17	SN74L08N	14	7
30	SN74L20N	14	7
10	SN74L03N	14	7

R22
R15 NOT USED

S UNLESS OTHERWISE NOTED.
OTHERWISE NOTED.
THERWISE NOTED.
OWN.
SE NOTED.
NAL TEST.

Figure 3-12. Logic, sheet 1 3100


A
B
C
D
IC 4
SN7400N
IC 8
SN7400N
IC21
SN7400N
IC15
SN74L75N
IC19
SN74L75N
IC22
SN74L75N
IC13
IC 9
SN7400N
IC20
SN7400N
IC23
SN74196N
C21
.05
C22
.05
C24
C25
.05
C26
10
VCC
R33
15K
R39
1K
T2
C28
.01
CR14
IN3064
Q13
2N4275
C29
680pF
IC
1-8
C30
.0039
IC
17C
R40
5.1K
R41
5.1K
R42
470
R43
2.4K
R44
2.4K
Q14
2N4275
R45
H
TIME BASE
VCC
1ST L.O. PRESET COUNT

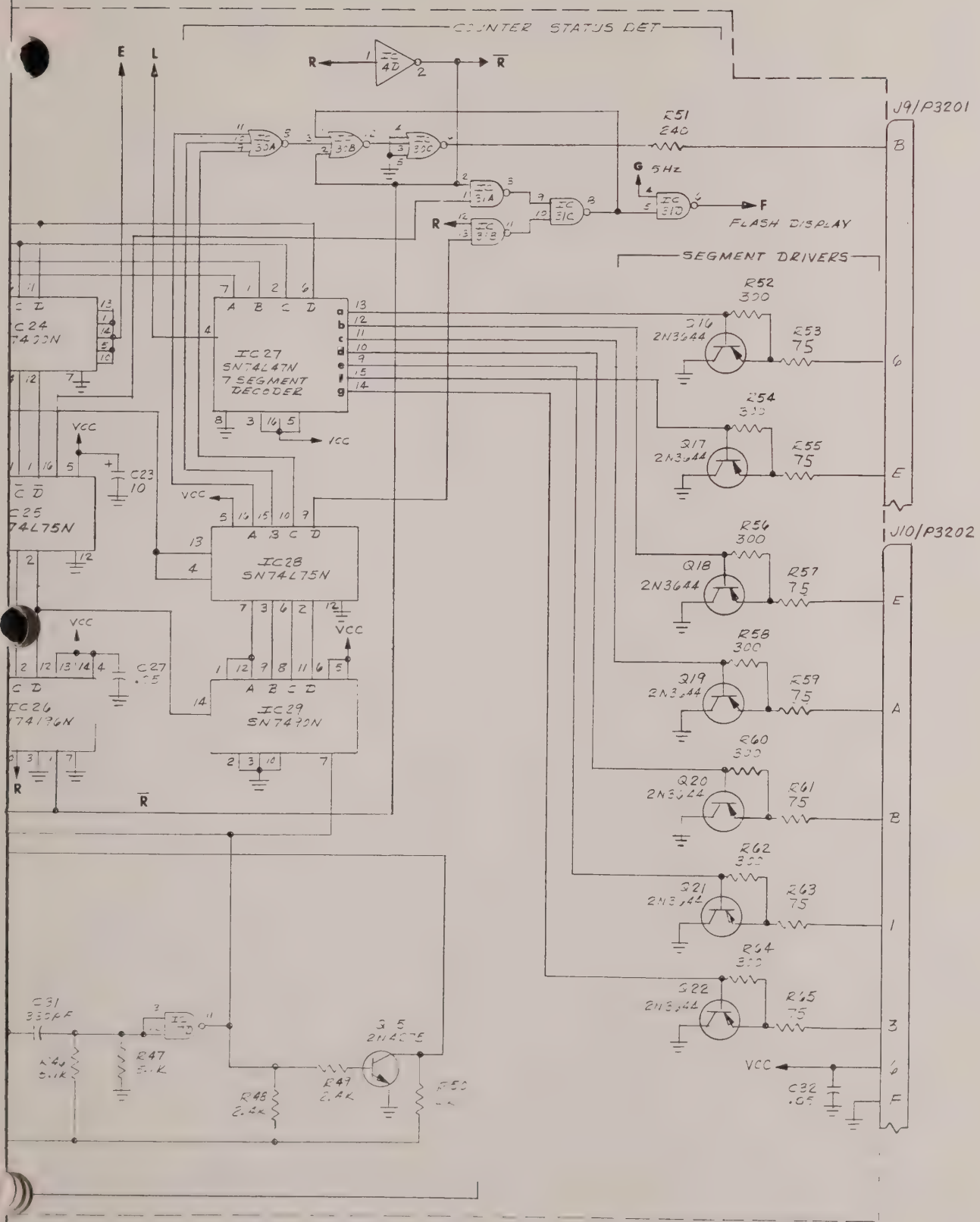
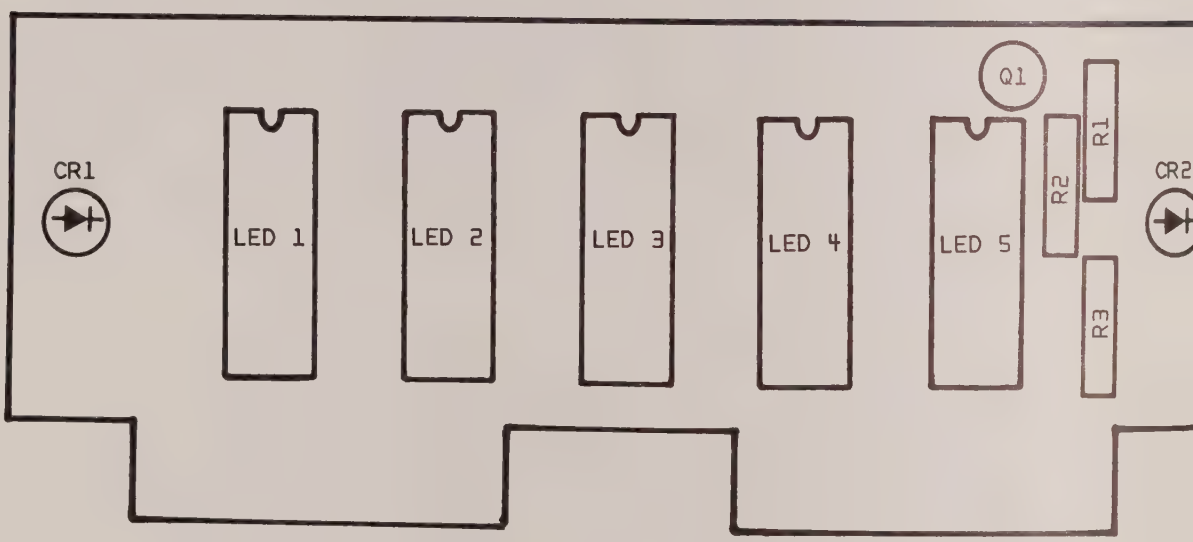
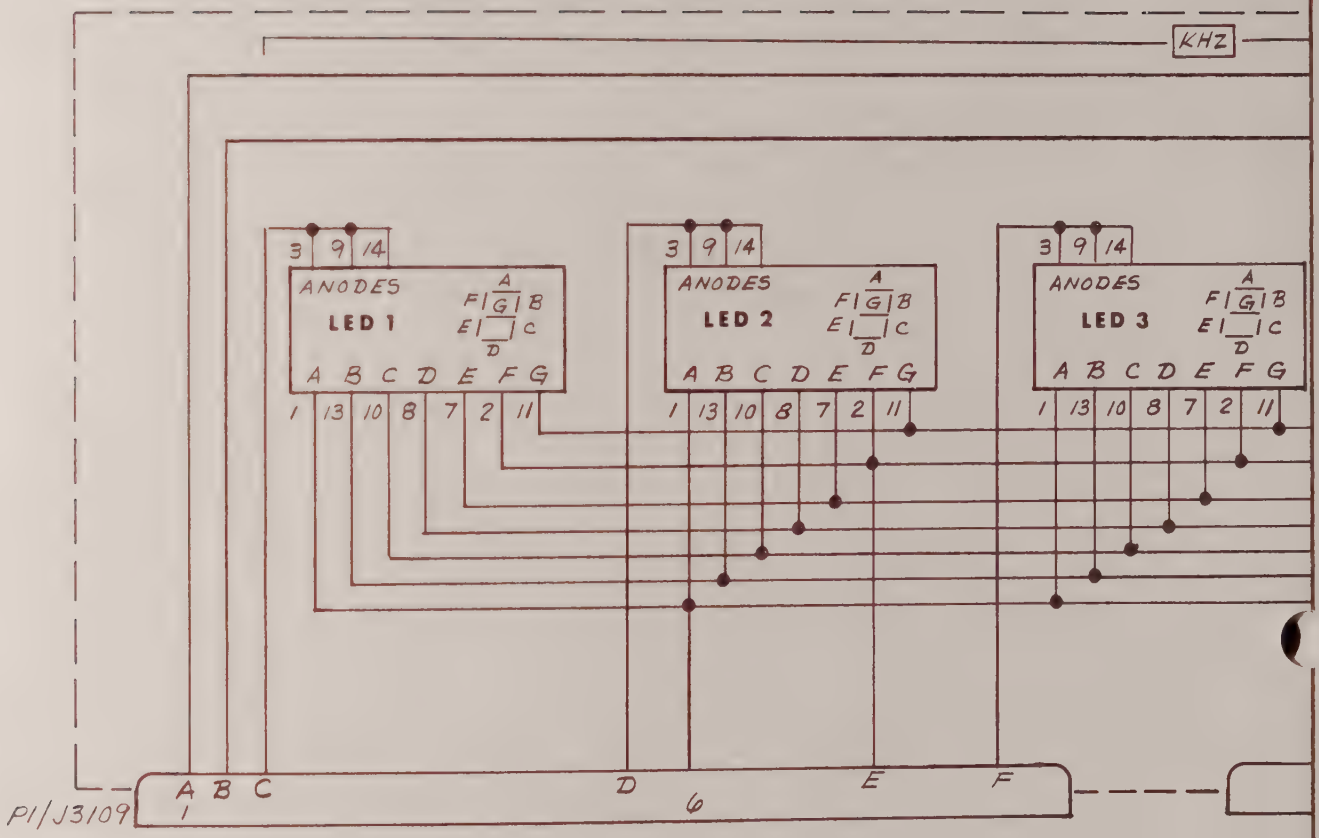


Figure 3-13. Logic, sheet 2 3100

L.E.D. DISPLAY. 3200

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
3200	LED Display	7001-0453	Cushman	
	P.C. Board	1780-0481	Cushman	
	DIODES			
LED 1	Alpha-Numeric Seq. Readout, HP7730	1281-0081	HP	5082-7730
LED 2	Alpha-Numeric Seq. Readout, HP7730	1281-0081	HP	5082-7730
LED 3	Alpha-Numeric Seq. Readout, HP7730	1281-0081	HP	5082-7730
LED 4	Alpha-Numeric Seq. Readout, HP7730	1281-0081	HP	5082-7730
LED 5	Alpha-Numeric Seq. Readout, HP7730	1281-0081	HP	5082-7730
CR1	Light Emitting Diffused, HP4880	1281-0069	HP	5082-4880
CR2	Light Emitting Diffused, HP4880	1281-0069	HP	5082-4880
	RESISTORS			
R1	Comp, 300Ω, ±5%, 1/4W	1066-3015	Allen-Bradley	CB3015
R2	Comp, 5.1k, ±5%, 1/4W	1066-5125	Allen-Bradley	CB5125
R3	Comp, 5.1k, ±5%, 1/4W	1066-5125	Allen-Bradley	CB5125
	SOCKETS			
XCI1	14 Pin, Dual In-Line	2606-0004	Cinch	133-51-02-003
XCI2	14 Pin, Dual In-Line	2606-0004	Cinch	133-51-02-003
XCI3	14 Pin, Dual In-Line	2606-0004	Cinch	133-51-02-003
XCI4	14 Pin, Dual In-Line	2606-0004	Cinch	133-51-02-003
XCI5	14 Pin, Dual In-Line	2606-0004	Cinch	133-51-02-003
	TRANSISTORS			
Q1	Si, PNP, 2N4249	1271-0024	Fairchild	2N4249


CR1
LED 1
LED 2
LED 3
LED 4
LED 5
Q1
R1
R2
R3
CR2



NOTE:

1. RESISTORS - 1/4W, 5% VALUES IN OHMS UNLESS OTHERWISE NOTED.
2. CAPACITORS - VALUES IN μF UNLESS OTHERWISE NOTED.
3. INDUCTORS - VALUES IN μH UNLESS OTHERWISE NOTED.
4. *FACTORY SELECT. TYPICAL VALUE SHOWN.
5. ALL VOLTAGES ARE DC UNLESS OTHERWISE NOTED.

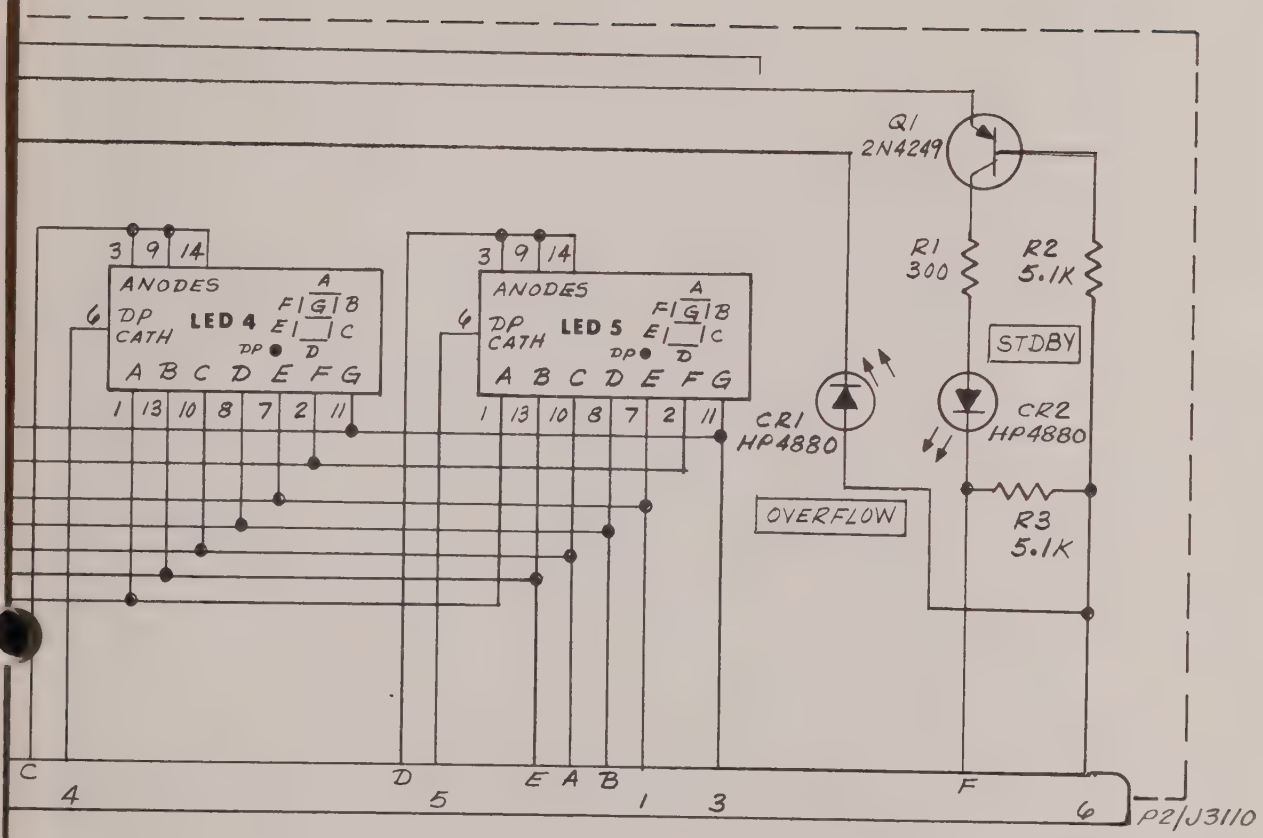


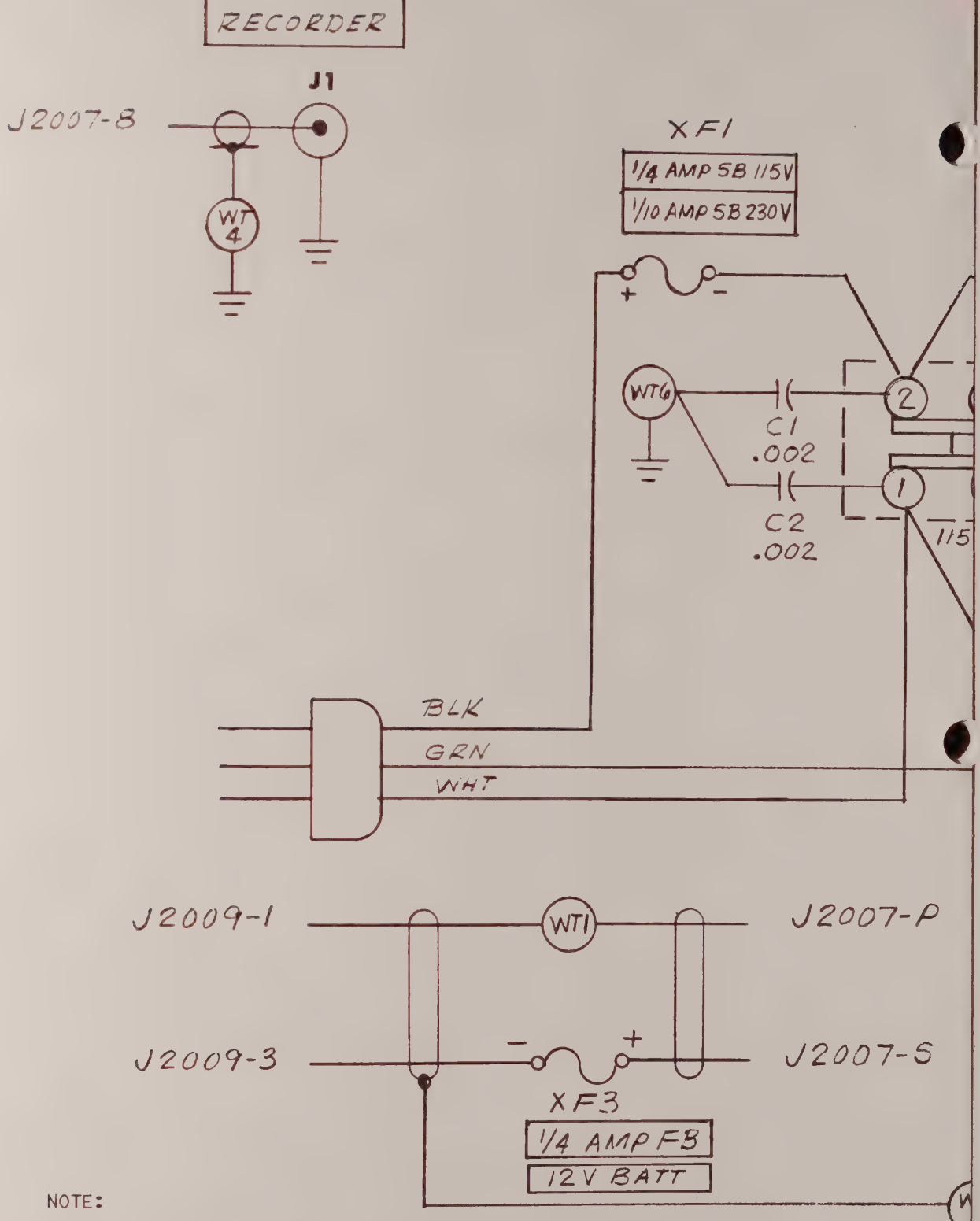
Figure 3-14. L. E. D. Display. 3200

REAR PANEL. 4000

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
4000	Rear Panel Assembly	7003-0085	Cushman	
	CAPACITORS			
C1	Cer, 2200pF, ±20%, 3KV	1005-0098	Erie	818Y5
C2	Cer, 2200pF, ±20%, 3KV	1005-0098	Erie	818Y5
	CONNECTOR			
J1	BNC, Bulkhead	2536-0010	Kings	KC79-35
	FUSES			
F1	1/4 Amp/125V, Slow-Blow, 3AG	1955-0013	Littelfuse	313.250
F2	1 Amp/250V, Fast-Blow, 3AG	1955-0003	Littelfuse	312.001
F3	1/4 Amp/250V, Fast-Blow, 3AG	1955-0015	Littelfuse	312.250
XF1	Fuseholder, Panel Mount, 3AG	1965-0001	Littelfuse	342012AL
XF2	Fuseholder, Panel Mount, 3AG	1965-0001	Littelfuse	342012AL
XF3	Fuseholder, Panel Mount, 3AG	1965-0001	Littelfuse	342012AL
	SWITCH			
S1	Slide, 115/230V	1850-0012	Switchcraft	46256LFR
	TRANSFORMER			
T1	Power	1575-0024	Cushman	

REAR PANEL. 4000

KT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
4000	Rear Panel Assembly	7003-0085	Cushman	
	CAPACITORS			
C1	Cer, 2200pF, ±20%, 3KV	1005-0098	Erie	818Y5
C2	Cer, 2200pF, ±20%, 3KV	1005-0098	Erie	818Y5
	CONNECTOR			
J1	BNC, Bulkhead	2536-0010	Kings	KC79-35
	FUSES			
F1	1/4 Amp/125V, Slow-Blow, 3AG	1955-0013	Littelfuse	313.250
F2	1 Amp/250V, Fast-Blow, 3AG	1955-0003	Littelfuse	312.001
F3	1/4 Amp/250V, Fast-Blow, 3AG	1955-0015	Littelfuse	312.250
XF1	Fuseholder, Panel Mount, 3AG	1965-0001	Littelfuse	342012AL
XF2	Fuseholder, Panel Mount, 3AG	1965-0001	Littelfuse	342012AL
XF3	Fuseholder, Panel Mount, 3AG	1965-0001	Littelfuse	342012AL
	SWITCH			
S1	Slide, 115/230V	1850-0012	Switchcraft	46256LFR
	TRANSFORMER			
T1	Power	1575-0024	Cushman	



NOTE:

1. RESISTORS - 1/4W, 5% VALUES IN OHMS UNLESS OTHERWISE NOTED.
2. CAPACITORS - VALUES IN μF UNLESS OTHERWISE NOTED.
3. INDUCTORS - VALUES IN μH UNLESS OTHERWISE NOTED.
4. *FACTORY SELECT. TYPICAL VALUE SHOWN.
5. ALL VOLTAGES ARE DC UNLESS OTHERWISE NOTED.

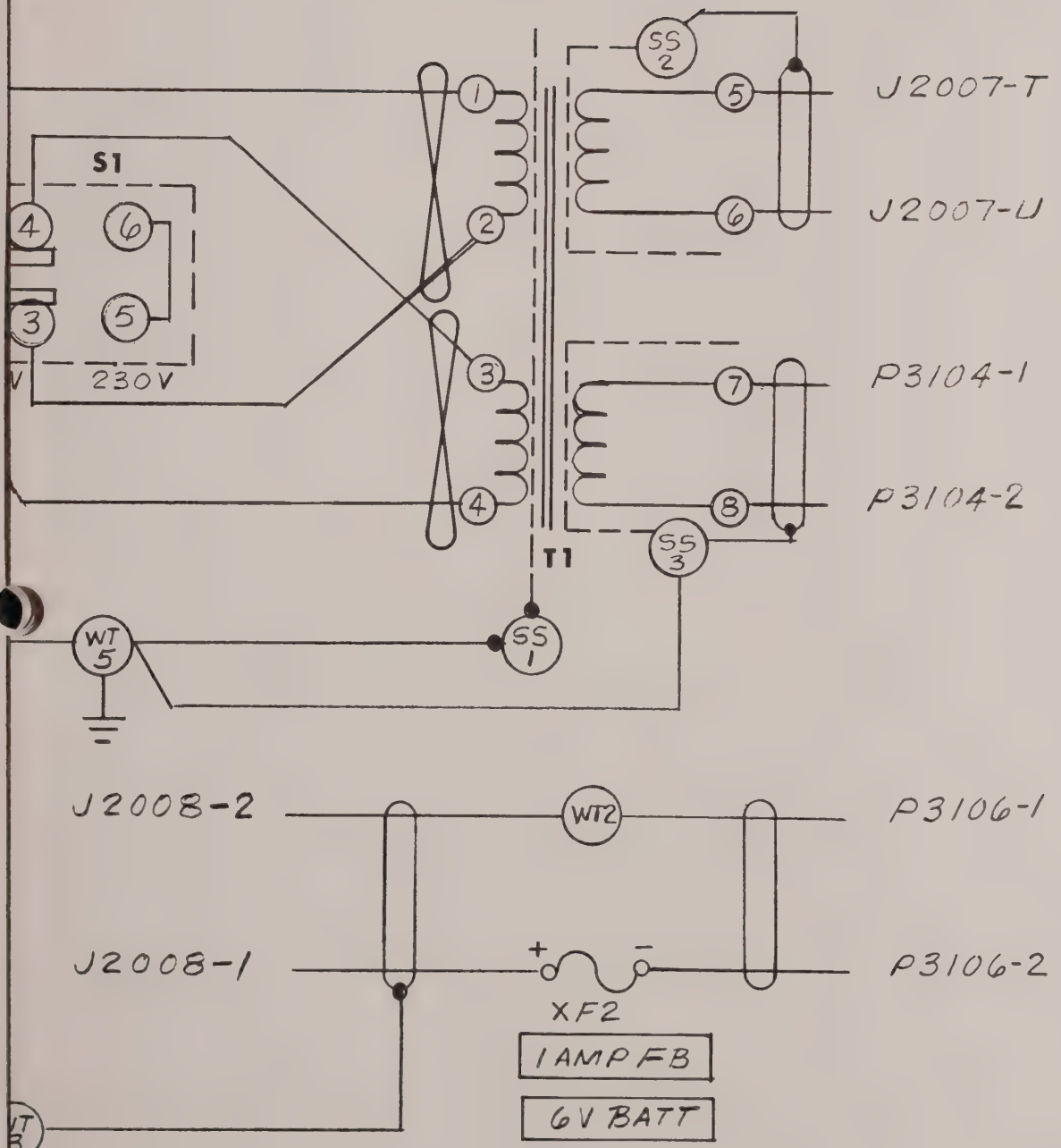


Figure 3-15. Rear Panel Interconnection Diagram. 4000

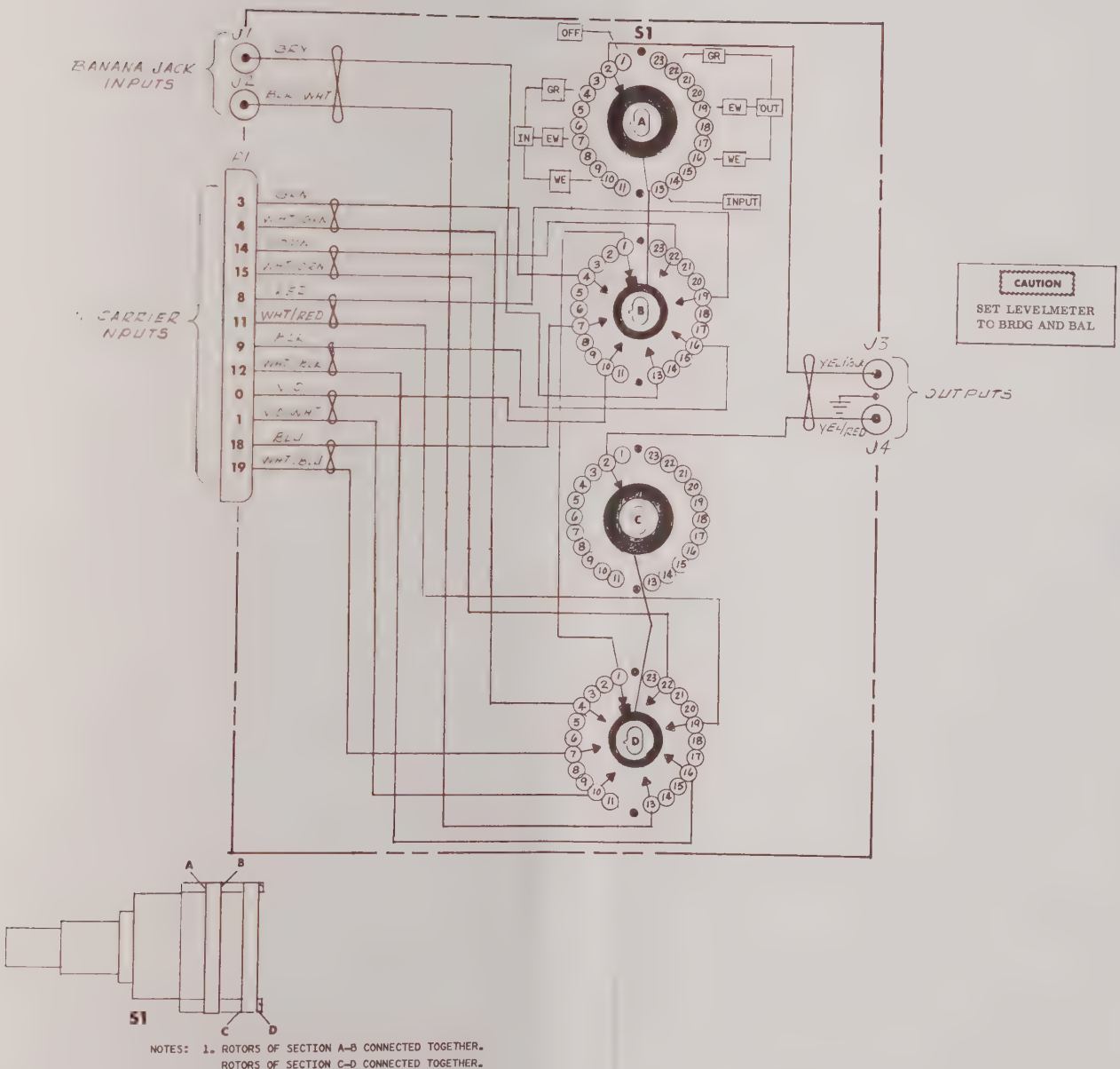


Figure 3-16. N-Carrier Adapter.

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Company_____

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